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ECONOMIC DIVERSIFICATION IN BRUNEI DARUSSALAM:

THE CASE OF WET RICE AGRICULTURE

BY

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ABSTRACT

Brunei Darussalam's renewed efforts at wet rice cultivation is partly a response to the 2007/2008 global food crisis, and mark its attempt at both economic diversification and food security. This study, aims to assess the effectiveness of the *Wasan* Scheme in contributing to the economic diversification and food security goals of the government of Brunei. Research was conducted at the *Wasan* Scheme located at the Mulaut Plain and compared two groups of farmers in the *Wasan* Scheme namely (a) retired army personnel and (b) local community and how these groups contribute to enhance the productivity of the wet rice agriculture projects. The study employed a mixed-methods approach. Using a sample of 52 farmers, as well as officials of the Department of Agriculture and Agrifood, the study generated quantitative and qualitative data which will be useful for the planning of future wet rice growing programmes. For the qualitative analysis, semi-structured interviews, observation and archival methods were carried out to gather data from rice farmers in the period between May 2010 and January 2011. For the quantitative phase, survey questionnaires of rice farmers and secondary data sources from various government policy documents were utilised. The results showed that farm size, number of workers, variable cost and years of experience affect the productivity of farmers. The study also finds that the problems, which work against the government's goal of diversification through agriculture, are poor irrigation and drainage system; inadequate knowledge and skills of farm management; lack of knowledge of diseases and pests control; and, the government's late payments for agricultural products/yield. Furthermore, problems in policy or the political economy of the state also point to Brunei's rentier state that hinders economic diversification and food security. Far-reaching implications of my findings will, therefore, be addressed too.

DECLARATION

I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

Signature:.....

ACKNOWLEDGMENTS

Bismillahirrahman nirahim.

This thesis would not have been completed without Allah's mercy, blessings and guidance.

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For all those who have assisted me in one way or the other and their names have not been mentioned here, I say a big thank you.

DEDICATION

This thesis is dedicated especially to all my beloved family, my dearest husband, Zamir, my children; Norafiqah Amirah, Nur Adriana Amirah and Md Adam Danish and my parents, Haji Kamarulzaman Md Taha and Hjeh Seriah Ismail for their endless moral support, prayers, love and sacrifices.

LIST OF ABBREVIATIONS

BAR	Brunei Annual Report
FAO	Food and Agriculture Organization
DAA	Department of Agriculture and Agrifood
DEPD	Department of Economic and Planning Development
DTCP	Department of Town and Country Planning
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GNP	Gross National Product
HM	His Majesty
MPRT	Ministry of Primary Resources and Tourism
NDMC	National Disaster Management Council
NDP	National Development Plan
OBG	Oxford Business Group
OPEC	Organisation of Petroleum Exporting Countries
RFFS	Rice Farmers Field School
TOL	Temporary Occupation License
UN	United Nations
UNFAO	United Nations Food and Agriculture Organisation
UNDP	United Nations Development Programme
UNFCC	United Nations Framework Convention on Climate Change
WFS	World Food Summit
WTO	World Trade Organisation

CHAPTER 1

Overview and Scope of the Study

1.1.Introduction

The 2007-2008 global food crisis, which saw prices soar dramatically to unprecedented highs, serves as a reminder of how vulnerable developed and developing nations are to food insecurity, and the necessity of economic diversification. The resulting sharp increase in all major food prices including rice, became grimmer when some major exporting countries decided to cut staple food exports, wreaking havoc for many countries such as Burkina Faso, Cameroon and Egypt (Food and Agriculture Organization of the United Nations, International Fund for Agricultural Development and World Food Programme, 2008). Oil exporting countries were also affected, due to their structurally precarious food security situations, despite record high oil prices and subsequent earnings at that time. Their huge reliance on food imports for the bulk of their food supply and absence of agricultural capacity, make such countries more vulnerable to food supply shocks (this refers to the trade relationship between the commodities of food and oil, or the depletion of their reserves within the oil exporting countries).

In response to these issues, oil exporting countries reassessed their agricultural policies. They faced the choices of whether to improve domestic production and/or to “land grab”, which is to say securing food imports supplies through international agricultural investments in other countries like Africa, Cambodia, Russia and other locations (e.g. Smaller & Mann, 2009). These food security initiatives, however, tended to largely overshadow the abovementioned issues, causing domestic food production or agriculture to remain unrecognised as an equally important part of national strategies of economic diversification for oil exporting countries. This issue together with multiple other problems including food security, regional development policy, employment generation and so on which have been relatively understudied, is the focus of this thesis with respect to Brunei Darussalam (hereafter referred to as Brunei – Figure 1.1). Thus, it is hoped that a contemporary case study derived from an oil-exporting economy will disentangle the different types of motivations/logics of

agricultural development in the case of Brunei.

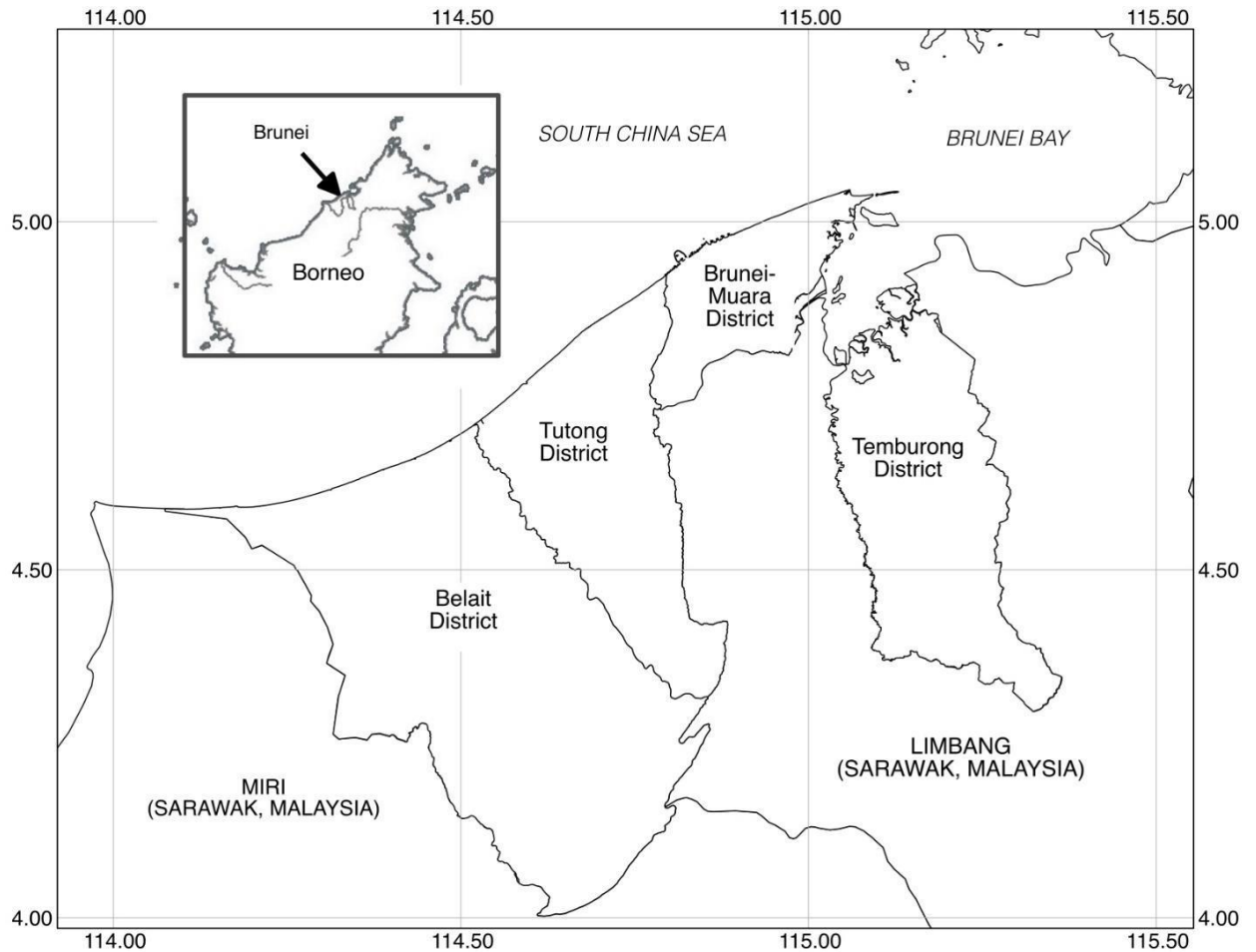


Figure 1.1: Map of Brunei

Source: Author

1.2. Background of the Study

Economic diversification has long been an issue of critical concern to commodity-export-dependent economies. In recent times the debate has been ongoing as to whether countries should specialize in commodities where they have comparative cost advantage, or engage in economic diversification into other activities. Oil producing countries, in particular, are faced with this dilemma. Most oil producing countries receive substantial revenue from oil to finance their development, and many have enough foreign reserves to buffer fluctuations in

these earnings over the short-term, and generate income for future generations over the long-term. Some of these countries have enough revenue to offer generous benefits including free health services, free housing, and subsidized food. The issue that remains, however is the ability of oil wealth alone to create sustainable economic growth. Consequently, oil producing countries such as the Gulf Cooperation Council (GCC states) (Hvidt, 2013) and Brunei have for the past 50 years pursued economic diversification strategies to counteract the economic problems associated with being too dependent on a single commodity (see Niblock and Malik, 2007; Rivlin, 2009; Seznec and Kirk, 2011 for GCC and CSPA, 2007 for Brunei). These problems have been extensively examined in research on the rentier state (Beblawi, 1987) and with reference to the Dutch Disease, which argues that considerable revenues from natural resources lead to the underdevelopment or neglect of other economic sectors because of the increase in currency values and inflated revenues from the resource industry (Cordon & Neary, 1982). Furthermore, the rentier state goes beyond this, one of the major problems of oil export dependence is political in that the political stability and legitimacy of the government becomes dependent on constantly providing oil-funded patronage to satisfy various groups in society. Brunei appears to exhibit this pattern (including in the Wasan programme), and this political dimension needs to be acknowledged and taken into consideration in any discussion on economic diversification.

One sector that oil exporting countries have sought to develop is agriculture. For Brunei agricultural development has been specifically listed as one of the national development objectives since the inception of the First National Development Plan covering the period 1953-1958, and has been pursued until today (Opai, 2008; CSPA, 2007). As part of Brunei's commitment to the development of agriculture, the government has allocated a budget of BND\$95 million in its 8th National Development Plan (2001-2005). Under the 9th National Development (2007-2011), the budget has increased to BND\$101,771,500 comprising of 1.1% of agriculture's overall share of the budget. It should be understood at the outset that agriculture in Brunei is tied in with issues of food security and economic diversification with each having different sets of goals. Food security is a protection against food price spikes, whereas economic diversification is a matter of domestic economy. In this context, diversification of Brunei's economy with particular reference to wet rice agriculture remains a high priority activity as stated in the various NDPs (see Chapter 3) and thus this research

looks at the policy of economic diversification and wet rice agriculture as a case study.

1.3.Problem Statement

In Brunei, the need to diversify the economy through agricultural development in particular through wet rice farming is one of the economic diversification initiatives that the Bruneian government has adopted and thus has gathered momentum in 2009. This was spurred by two factors: the 2007/2008 world food crisis and fall in global oil prices. The 2007/2008 crisis made a number of food exporting countries impose restrictions that restricted food difficult on the international market. Rice, Brunei's staple food, was most affected by the international trade disruptions. Thus, Brunei was not spared by the crisis as the country, according to the Department of Agriculture (2015), produces only 3% of its total rice demand and fills the gap with imports from Thailand and Vietnam. Brunei's 2007/2008-crisis induced food security problem was compounded by the fall in global oil prices which had and still has a negative impact on government revenue. This food security issue made Brunei's ruler and monarch, His Majesty the Sultan of Brunei Darussalam to question, in his 2009 royal address,

"...why is it that we, only achieving at 3.12% ... we should have our own strategic plan and national agriculture policy, amongst other things, that will guarantee national food security as one of its key strategies..." (DAA, 2009a:13)

Following His Majesty's royal address, Brunei reassessed its agricultural policy to adopt a more stringent policy of attaining food security to address its overreliance on the importation of staple food such as rice. This was stated as one of the objectives of the Brunei's Vision 2035, namely to achieve and improve rice self-sufficiency and food security to 20% in 2010 and 60% by the year 2015 for the country (Hajah Aidah, 2011). The country requires about 35,000 tonnes of rice per year, and to achieve this, it has to produce not less than 21,000 tonnes of rice per year by 2015 (Lassa, 2015). Furthermore, the government of Brunei has launched new agricultural initiatives, including the development of agricultural infrastructure, adoption of new high-yielding rice and hybrids such as *Laila* and *Titih* respectively, development of hydroponics/aqua phonics technology, improvement of post harvesting technology, improving production infrastructure and adopting the best rice variety that can yield more than 3-4 tonnes per harvest (Hajah Aidah, 2011).

How far the government has fared so far in its efforts to diversify the economy through agriculture and achieving self-sufficiency in rice production is little known. Overall progress and shortcomings of wet rice farming initiatives for economic diversification in Brunei are not well documented. In general, investments in agriculture as part of economic diversification strategies in oil producing countries remain understudied. It is, therefore, the intention of this study to examine the Brunei government's wet rice farming initiative in the context of economic diversification and food security. In particular, the study focuses on an initiative called the *Wasan* Rice Cultivation Scheme (hereafter referred to as *Wasan* Scheme).

1.4.Scope of the study

This study focuses on the largest wet rice agricultural project that has been in operation, as a case study site, covering the period from May 2010 to January 2011. This is a government wet rice agriculture project known as the *Wasan* Scheme and the farmers who are involved in this project. These farmers comprised of two groups namely: retired army personnel, Koperasi Setia Kawan Sdn Bhd (*Koseka*) and a collection of seven villages comprising (i) Kg. Junjungan; (ii) Kg. Limau Manis; (iii) Kg. Pengkalan Batu; (iv) Kg. Masin; (v) Kg. Wasan; (vi) Kg. Panchur Murai; and (vii) Kg. Batong known as the Mukim Pengkalan Batu Consultative Council (*Mukim*).

The rationale for choosing rice agriculture, and not the overall agricultural sector, is that rice farming is at the core of the government's economic diversification drive through agriculture. Rice growing was and still is one of the main agricultural activities, and at least fifteen varieties of local rice are grown and sold in the local markets. The variables studied in this *Wasan* project should provide information useful in the development of other wet rice projects to be launched in the future for economic diversification since little or no research has been done to find out how the programme has been meeting the various objectives proposed, and the reasons for this success or lack thereof. Therefore, this study provides new insights on the development of wet-rice agriculture in Brunei since its revitalization of wet rice agriculture in 2008 and the information generated from the study should be useful in guiding future policies by the government towards rice growing projects.

1.5.Aims and Objectives of the study and the Research Questions

The main aim of the study is to assess the operation of the project in terms of inputs, processes, outputs and outcomes of the project including the challenges face by farmers. Specifically, the objectives are:

- to assess the achievements of these goals;
- to identify implementation issues and challenges; and
- to come up with policy recommendations to boost the performance of such a project to better achieve economic diversification.

The following research questions have been formulated for investigation:

- 1) What are the primary goals of the *Wasan* wet rice agricultural project?
- 2) How successful has the *Wasan* wet rice agricultural project been at achieving each of its stated (or implicit) goals?
- 3) Can certain factors explain the success or failure at achieving these various goals?
- 4) How does this inform our understanding of development in raw material export dependent economies more generally?
- 5) What policy recommendations can be made on the basis of these findings?

These research questions form the framework for the present study.

1.6. Conceptual Framework of the Study

While economic diversification is normally seen from the national perspective (macro level), the case understudied (*Wasan* wet rice scheme) is more appropriately to be seen and understood from the micro level perspective. In order to better understand the relationship between the two levels, the different variables involved in the study (independent or dependent) based on the literature review in Chapter 2 are organised into a conceptual framework.

According to the UN (2011), the main variables that must be given attention for economic diversification to thrive or survive are

- good governance
- private sector development
- utilisation of natural resources for the development of other sectors and
- positive institutional capacity and human resource.

Good Governance is referred to characteristics such as transparency and citizen participation to manage the economy. The United Nation document provides a number of examples of good behaviour of governments in respect of economic diversification and these are *supportive of weak economic sectors and coordination amongst different 'executive drivers' such as stakeholders.*

Private sector development is about moving away from government-centric development towards a more market-oriented development. The examples given by the UN document referred to earlier are the *enhancement of private sector's leading role in the country's economy* and *institution of friendly policy to investors.*

Use of natural resources refers to the application of a 'balanced-development' approach where the revenues of natural resources are used to develop not only the strong economic sectors but also weaker sectors as highlighted by the United Nation document. For diversification to take place '*greater attention to the development of weak economic sectors*' is needed.

Institutional capacity and human resource are other important variables which need to be given attention if a country is to diversify. The United Nation document specifically highlighted the following variables:

- *Allocating resources to R&D*
- *Training graduates in public policy*
- *Curriculum review of higher learning to include agricultural programmes*

The detail discussion of these variables are given in Chapter 2. The usefulness of this information is that it can be used to examine the success and failures of an economic diversification initiative from a macro-level perspective.

The United Nation document (2011) further explains that the dependent variables listed below will be affected by the issues referred to earlier. These dependent variables are:

- *Sustainable economic prosperity;*
- *High standard of living;*
- *Insulation from external economic volatility and shock;*
- *Strong and sustainable economy;*
- *Diverse of array of wealth;*
- *New knowledge and technology;*
- *Stable political and economic climate;*
- *Mix of a fair number of other industries and sectors;*
- *Multiple sources of income;*
- *Government revenues;*
- *Export receipts; and*
- *Employment generation*

These dependent variables can be taken as indicators of success and can be achieved in the presence of positive conditions for economic diversification – determinants of diversification. Figure 1.2 below illustrate the determinants and outcome of diversification.

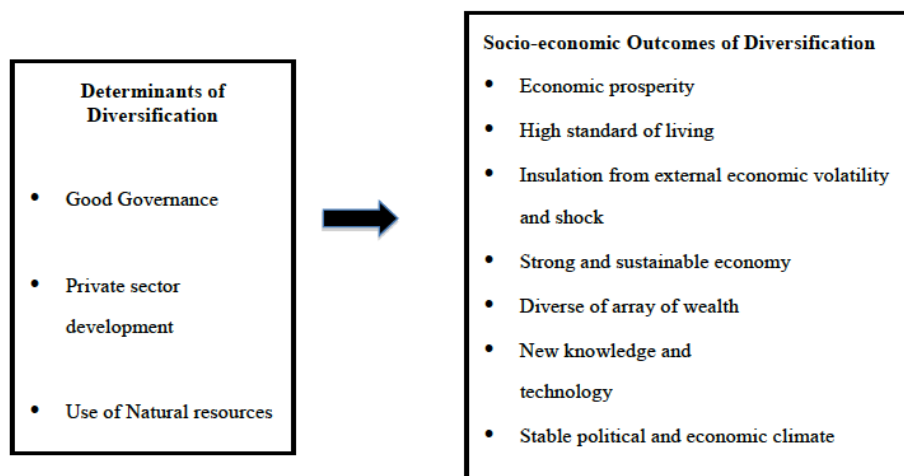


Figure 1.2 Determinants and Outcomes of Diversification
Source: Adopted from the UN (2011)

The above diagram is useful in terms of providing information as to what are the likely causes or reason/s for not achieving socio-economic outcomes when significant budget and efforts have been invested in diversification. For example, policy recommendations can be formulated to address any shortfalls in the areas listed as determinants of diversification.

Another set of literature related to economic diversification at the micro-level, particularly the work of Buchenreider & Mollers (2006), explain that the migration into and from agriculture will determine to a large extent whether or not diversification will succeed. They believed that the shift of households or families from agriculture to rural non-farm activities is a positive direction for more diversification to take place. They introduced the idea of 'push' (discouraging) and 'pull' (encouraging) factors influencing movement from traditional farm activities towards non-farm activities. These micro-level variables have significant influence on the outcome of economic diversification at the macro level.

According to them, the sets of factors influencing movement from traditional farm activities towards non-farm activities include

- a) the 'pull' factors which promote the development of non-farm activities
 - Educational level, skills, knowledge
 - Positive attitude towards working and/or living in town
 - Existence of social networks facilitating diversification by reducing cost
- b) the 'push' factors which slow down the development of non-farm activities
 - Insufficient access to land and low land productivity, small farm size
 - Low farm labour productivity
 - Lack of self-financing capability for farm investments
 - Inefficient land and credit market
 - Large family size with many dependent family members
 - Negative attitude towards farming and rural livelihoods
 - Generation conflict
 - Natural disasters, shocks

On the other hand, the sets of factors hindering movement from traditional farm activities towards non-farm activities include

a) the ‘pull’ factors which promote the development of non-farm activities:

- higher wage rate in non-farm sector
- labour demand in non-farm sector
- optimistic rural business environment
- appropriate infrastructure, e.g. *road, schooling and vocational training network*
- information availability
- efficient land and credit market
- existence of rural development plans/ projects/programmes

b) the ‘push’ factors which slow down the development of non-farm activities:

- Less favoured market structures and high unemployment rates
- Lack of infrastructure
- Inefficient institutions
- Legal and cultural barriers, norms
- Lack of livelihood capital assets

These ‘pull’ and ‘push’ factors are useful in understanding the ‘dynamics’ of *Wasan* wet rice project as a diversification drive of Brunei government. The United Nation’s recommendations on the determinants of diversification (macro-level) and Buchenreider & Mollers (2006) identification of micro-level factors influencing diversification are put together in a conceptual frame as shown subsequently in Figure 1.3.

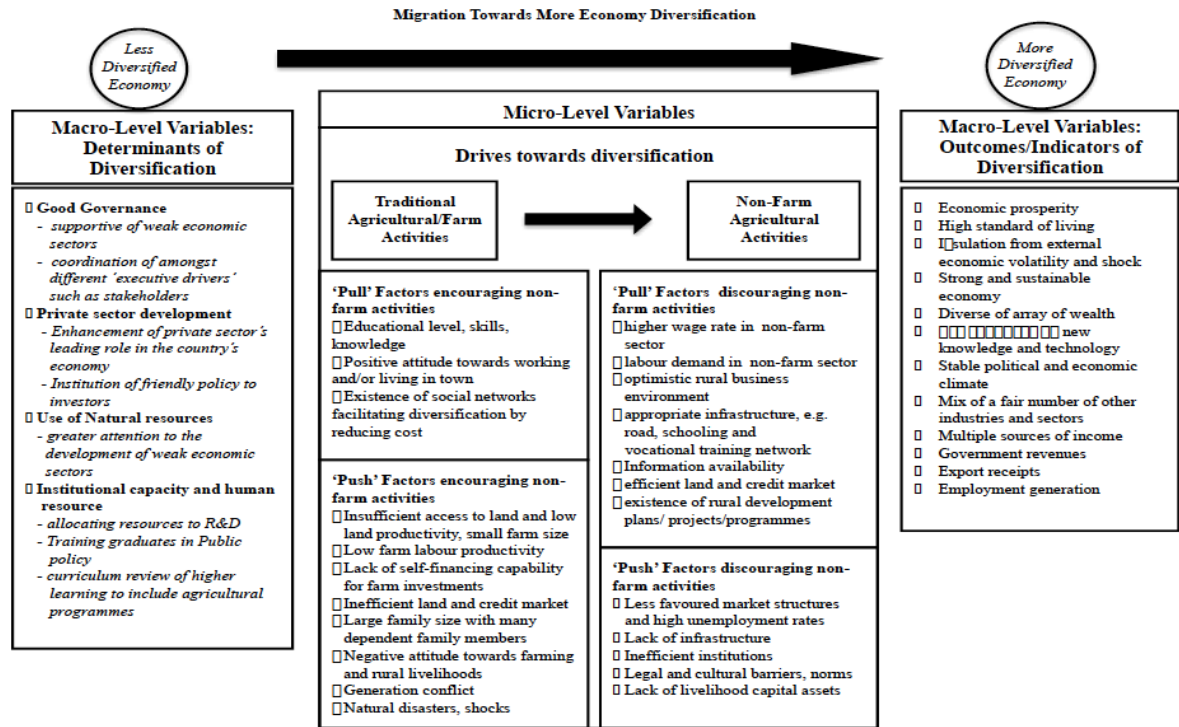


Figure 1.3: A conceptual framework developed for this study
Adopted from UN (2011) & Buchenreider & Mollers (2006)

In this study, the research findings will be examined against the variables listed in the conceptual framework and in evaluating the contributions of *Wasan* wet rice project to the economic diversification of Brunei. This is specifically relevant in answering research question 3, “What factors explain the success or failure at achieving these various goals?”

This will also help in the policy recommendations needed to better achieve the diversification outcomes.

1.7. Significance of the study

The study is significant in many respects. From the perspective of Brunei, the knowledge of implementation problems and issues associated with the wet rice project as a result of the study, should assist administrators in various ways. These include improving the productivity of wet rice farming through effective organisation of training programmes targeted to improve farmers and the Department of Agriculture and Agrifood (DAA) capabilities. It should also allow the review of agricultural policies and programmes, especially those that

have failed to reach their intended impact, in order to enhance the productivity and effectiveness of the farming system and its capacity to contribute to the diversification needs of Brunei. Morale problems which might have arisen due to conflicts in policy directives in the implementation of agricultural policy, will also be apparent. This helps them increase the effectiveness of communication among administrators, policy-makers, implementers, and farmers by reinforcing more favourable attitudes towards bringing about a positive change in wet rice farming. Thus the study will not only contribute to the development of wet rice growing in the country but also support the achievement of the government's economic diversification policy.

From the international perspective, the information obtained from the study should provide policy-makers in the agriculture sector and administrators and researchers, particularly in small states, with valuable lessons that could be derived from Brunei's experience. Secondly, there has been little research conducted in the implementation of wet rice agriculture project on oil exporters like Brunei that is aggressively promoting economic diversification. The findings of this study, therefore, would make a significant contribution to our understanding of agricultural development in oil-export dependent economies. Moreover, the findings will enrich the data already available on related studies in the field of economic and cultural geography as well as stimulate further research studies in the area of agriculture both locally and abroad. Thirdly, this study is unique and potentially useful for future comparative studies. In particular, Brunei shares many similarities with and differences from other countries such as the Gulf Cooperation Council (GCC) states that includes the monarchical system of government and the absence of a federal system, political parties, a parliamentary system and absence of income tax. It may also add a new dimension to the understanding of the policy and policy process developments in the agricultural sector. Finally, in terms of theoretical development, the study can be seen as an extension to the existing theories.

1.8. Organization of Thesis

This thesis is organised into six chapters. The **first chapter** represents the foundation of the study. It has presented the background of the study which provide information on the issues

and problems associated with food insecurity and the policy response adopted by Brunei specifically and oil exporting countries generally. It has also presented the problem statement, the study's scope, aims and objectives as well as the research questions. A conceptual framework has also been developed to better understand the variables involved in the study. The chapter ends with the presentation of the significance of the study and organisation of the thesis.

Chapter Two is a review of some selected literature relevant to the study title. It begins with a theoretical discussion of the problems typically faced by raw material exporting countries, particularly oil exporting countries, namely: the 'resource curse'; the 'Dutch disease'; the rentier state and so on. This is followed by the definition of 'economic diversification' and the determinants of its success from the macro- and micro perspectives drawing from the ideas from the UN framework as well as the work of Buchenreider & Mollers (2006) on 'push/pull' factors that determine whether diversification will succeed or not. The issue of food security is also discussed in relation to economic diversification. The case of agricultural development in the GCC states is then examined in terms of the goals of economic diversification, food security and rentier state political economy in order to understand their similarities and differences in relation to Brunei.

The **third chapter** sets the background and context of the study in Brunei. This includes Brunei's geographical location, population and government and the economy and diversification drive. It also addresses in great detail the Brunei's rice farming policy and development as part of the country's agriculture and agri-food strategies as a contributor to not just long-term national socio-politico stability but also the GDP.

Chapter Four describes the research methodology used in the study. It discusses the qualitative and quantitative data collection techniques used which includes data sampling; the justification for the employment of a case-study method; semi-structured interview, analysis of secondary data, survey questionnaire; issues of validity and reliability of data; ethical issues, challenges and problems encountered in the process of collecting data.

Chapter Five presents the analysis of the data collected pertaining to the basic characteristics of the rice farmers and their operations; resources and production of the farms in terms of

operational inputs and outputs; assessment of the balance of incomes and costs as a measure of profitability; and inferences on any relationships between farmers' characteristics and their operating capabilities. It discusses the findings of the interview data and analysis of primary and secondary data in order to provide answers to the research question. There are also major problems outlined here that are important to the discussion of the sustainability of rice agriculture as a significant revenue-producing diversification tactic and these include inadequate water supply; poor drainage system; outbreak of disease and pest; late government payment for their farm produces; unreliable supplies of subsidized inputs such as fertilisers and pesticides; lack of infrastructure and technical supports. A sample of data in relation to those challenges are shown. These variables and others presented in the key findings of Chapter 5 show that at its present stage of development the *Wasan* scheme is unlikely to significantly contribute to economic diversification for a number of reasons, including that it does not present new job opportunities, or only limited ones open to a small population. Farming is concluded to be an unattractive occupation in Brunei, being associated with the low-status, minimal wage and uneducated strata of society.

The sixth or last chapter discusses the findings of the study in order to provide answers to the research questions. It then presents the conclusion and the recommendations for successful policy implementation of wet rice cultivation in Brunei. Based on the evidence in the data that should help overcome the challenges faced by rice farmers, in light of achieving sustainable and significant economic diversification that benefits all rice farmers. These include the introduction of provisions in the scheme for scaling up rice farming operations, provided that the farmer can demonstrate capability to operate larger-scale farms, e.g. through good track record of farm operation and productivity over a number of years, and/or a sound business plan. Creating flexibility in government schemes, and links to technically relevant and competent support systems for rice farmers, are two key points of contention presented by the researcher in the final chapter, amongst others.

CHAPTER TWO

Concepts and Theories of Economic Diversification

2. Introduction

This chapter covers three aspects: firstly, theoretical considerations – a discussion of the theories, such as resource curse, the Dutch diseases and rentier state that explain the state of economic diversification in oil-exporting countries. To support or critique the theories' claims, the author draws examples from different oil-exporting countries such as the Gulf States, Malaysia, and Indonesia. Secondly, the author offers a conceptualisation of economic diversification, that is the definitions and determinants of economic diversification as well as factors which affect economic diversification. Lastly, the authors provides a discussion on food security in oil-exporting countries. These three aspects are addressed in relation to Brunei's economy and its agricultural-based economic diversification efforts which are also meant to enhance food security in the country.

2. Theoretical considerations

There are a number of theories that explain the success or failures of economic diversification, especially in oil-rich economies such as Brunei. The most leading ones are the resource curse theory, the Dutch Disease and the rentier state theory. This section discusses how the aforementioned theories help us to understand how and why countries rich in natural resources particularly oil-rich economies struggle to diversify. The discussion guides this research work as it focuses on economic diversification in Brunei through agriculture.

2.2.1. The 'Resource Curse Theory'

The theory of Resource Curse, also known as the 'Paradox of Plenty,' suggests that countries develop and utilise their abundant natural resources, especially non-renewable ones, at the expense of the other sectors of their economies (Veneables, 2016; Sachs and Warner, 1995; Van der Ploeg, 2011; Larsen, 2004). This results in an unbalanced economy, with retarded

growth (Sachs and Warner, 1995) and lack of industrialisation (Karl, 1997; Sachs and Warner, 1995; Auty, 1994; 1993; Gelb, 1988). Of course, this definition of resource curse is only applicable to developing countries. There are, however, some developing countries such as Botswana (Acemoglu et al., 2003; Sarraf and Jiwnajji, 2001); Chile (Fuentes, 2010; Hojman, 2002); Indonesia (Usui, 1997; 1996; Booth, 1995) and Malaysia (Rasiah and Shari, 2001; Royan, 1999) which upon the exploitation of mineral resources have been able to channel the proceeds towards industrialisation, and that was made possible through investments in social welfare and development of the private sector (Rosser, 2007; Humphreys et al., 2007; Sandbu, 2006; Davis et al., 2001; Birdsall and Subramanian, 2004). Malaysia, as an example, has overcome the problem of resource curse due to a combination of good geographical location, deep-water ports and rubber and tin and forest products, which preceded oil as export staples; heavy investments in technology and infrastructure, especially in the areas of energy, communications and transport (Gelb, 2010). The post- independence political leader, Dr. Mahathir undertook deliberate decisions to industrialize Malaysia learning from advanced economics such as the USA and the U.K. One of the crucial decisions undertaken by him was the encouragement of Foreign Direct Investment. In the mid-1980s, the country's strategy moved more towards higher-technology products and skills upgrading. The driving policies included liberalizing skilled immigration, a dramatic expansion in enrolment in polytechnics, exchange relations with universities in Australia and Canada and skills development programs jointly sponsored by the Federation of Manufacturing and the University of Science and Technology (Gelb, 2010). Significant growth and increase in the standard of living have been a result of this policy.

The question is how is it possible for abundance natural resources in a developing country to 'curse' the country by distorting its socio-economic and political development? What is the relationship between abundance of natural resources and the 'curses'? Are there any causal mechanisms that might turn resources from 'advantages' or 'opportunities' into problems? One of the casual mechanisms is through negligence in the development of human resources (Hamburg, 2005). Since the rich resource sector usually demands low- skilled and little high-skilled labour, the development of broad-based medium-skilled workers necessary for the growth of the manufacturing sector (tradable sector), is neglected. As a result, the manufacturing and other tradable sectors are shrinking while the non-tradable sectors are

expanding (see section 2.2.2 the Dutch disease).

The quality and the kinds of investments made by governments determine whether or not abundant natural resources can become an economic ‘opportunity’ or a ‘curse’. The experience of Nauru, a small country in the South Pacific demonstrated this reality. Nauru derived enormous wealth from its phosphate deposits which made it one of the richest in the South Pacific but the country frittered it away. Nauru’s revenue from the exploitation of this mineral deposit has been invested in property estates both within and outside the country ignoring the development of its human resources. Not only did it exploit the mineral deposit to exhaustion, it needed to spend millions of dollars to revive its damaged natural environment due to the mining activities. The country had to sell most of its assets to pay for its deficits caused by currency depreciation, subsidised airlines and unrealistic consumption of its wealth (“Pacific Islands”, 1995:pp.9). One reason for the country’s failure in socio-economic development is the absence of investment in human resource development. One can only imagine how Nauru survived without knowledgeable, skilled and motivated people. The Nauru experience underlines the need to ensure that the country’s resources are efficiently and effectively invested.

2.2.2. The Dutch Disease

The term Dutch Disease refers to the failure of natural resource-abundant economies to promote a competitive manufacturing sector and, hence, economic growth (Corden, 1994). According to Bategeka and Matovu (2011), a country that experiences the Dutch Disease goes through six stages: firstly, a decrease in the price of imports and increase in quantity of imported goods and services; secondly, a rise in the process of services and construction which are non-tradable; thirdly, neglect or disincentives for tradable, such as manufacturing and agriculture; fourthly, manufacturing and agriculture become unproductive and non-competitive; fifthly, mixed welfare outcomes from people dependent on tradable and non-tradable; and lastly, a deformed and mixed growth economy.

2.2.3. The Rentier State

According to Mahdavy (1970), a rentier state is a country that gets money on a regular basis

from external rent. Mahdavy (1970) argues that external rent, in this case, represents monies paid by foreign individuals, government and other concerns to a given state. These monies paid by foreign individuals could be in the form of payment for passages of oil pipelines through transit countries. The author again indicates that, in these modern times, proceeds or monies gained from oil sales could also be described as external rent. Levins (2013) observes that in a rentier state or economy the government receives money from the sales of oil and, in turn, distributes it to its citizens through government projects and activities such as welfare/subsidies which lead to a “rentier mentality”. He points out that in such an economy, more often than not, people rely on the government for food, health service, and job opportunities. In a rentier state, the government plays a benefactor role, and the people might not rush for change (Levins, 2013). In fact, Levins (2013) indicates that in a rentier economy, there is always a “rentier mentality”, where the people believe that the government must supply everything including clothing. Similarly, Ozyavus & Schmid (2015) argue that in a rentier state, rulers are protected; there is little or no need for taxation and the obligation of the state to the people are relegated to the background.

The World Bank (2003) cited in Ozyavus & Schmid (2015) posits that in a rentier economy, three resource flow administrative behaviours are common. First “taxation effect” which means no taxation. For instance, Brunei does not have any income tax, no sales tax and some corporate organisations hardly pay tax (VanderKlippe, 2015). Secondly “spending effect” which means weak institutions and no pressure for reforms. Under this effect, the government overspends on social welfare and no or little accountability. This results in weak institutions that have no pressure to reform. The last effect is “group formation effect” which means the government obstructs the formation of independent social groups where it does not encourage democracy.

Brunei has been unable to escape the ‘rentier state’ condition. It is considered to be the purest rentier state in the Southeast Asian region as well as one of the purest and ideal oil-rich state globally, along with some Gulf countries (Haji Ismail, 1999 and Gunn, 1993). Similarly, Blomqvist (1993) believes that Brunei fits the rentier state theory due to three reasons: the country’s over-dependence on hydrocarbon resources; the provision of social welfare

benefits to its population using its export proceeds (commonly termed as “Shellfare”); and high reliance of people on the government for provision of jobs (about two-thirds of the total labour market). The remainder of the total labour constitutes guest workers, who tend to be concentrated in two highly polarized job categories, namely, manual and/or unpleasant tasks, and those requiring specialized skills (Tisdell, 1998; Neville, 1985).

The preceding discussion clearly shows that Brunei exhibits the characteristics and features of a rentier economy. Once a rentier mentality is developed it becomes difficult to diversify because people would try to get a share of the oil wealth by rent-seeking activities rather than earning their living by productive work. Where efforts to diversify are made, the conditions necessitating the diversification process are relegated to the background. First, the government feels that it does not need to live from taxes. Second, government (the ruling class) may have the fear of losing the power they hold if people are no longer dependent on them and third, the people would have already established a negative mental attitude towards diversification. It is, therefore, possible that diversifying the economy to include rice production may result in huge challenges.

2.2.4. The Resource Movement Effect

It is a situation where oil producing nations pay particular attention to the trade of oil and gas, while neglecting other sectors of their economies. For example, Heeks (1998) explain that the resource movement effect happens when most of the resources moved, traded, exported by a country are oil and gas products, thus neglecting products of other sectors like agriculture, fisheries, and manufacturing. Similarly, Cappelen and Mjøset (2013) report that resource movement effect is as a result of a shift of resources in an economy away from the production of traded goods and into the extraction of the natural resource. VanderKilippe (2015) states that, in Brunei, nearly 96% of exports are from the oil and gas sector, a far higher percentage compared to Saudi Arabia, Kuwait, and the United Arab Emirates. This implies that Brunei’s non-oil and gas sectors contribute about 4% to the country’s exports. Additionally, Brunei imports 96% of its rice, meaning that the country has a rice self-sufficiency of 4%. Both cases show that the resource curse effect is transpiring in Brunei.

The country is focusing more on the oil and gas sector and less on other sectors and food self-sufficiency.

2.3. Economic Diversification conceptualised

Economic diversification has been noted as one of the ways in which countries can achieve economic prosperity and raise the standard of living of its citizens. It is also seen as a method by which countries can insulate themselves from external economic volatility and shock. It has been argued that a strong, growing, sustainable economy is the goal of every nation in the world, and this comes about through a well-diversified economy (Shediac, et al. 2008; Farhauer & Kröll, 2011). According to these authors, a diversified economy enhances a nation's standard of living by creating wealth and jobs, encouraging the development of new knowledge and technology, and helping to ensure a stable political and economic climate (Shediac, et al. 2008). They also maintain that having a diversified economy that is based on a wide range of profitable sectors has consistently been thought to play a key role in a sustainable economy. In order to understand what constitutes economic diversification, the United Nations Framework Convention on Climate Change (UNFCCC, 2014) offers a clear definition of it. According to this organization economic diversification is defined as the process by which a different type of economic output is the result of different economic activities. This includes diversification of export markets and the income diversification sources from domestic economic activities. Put simply, it is an expansion of revenue sources, market, and contribution of various economic sectors for establishing strong and sustainable revenue to safeguard the national economy

Routledge Encyclopedia (2001:360) refers to diversification as “exports, and specifically to policies aiming to reduce the dependence on a limited number of export commodities that may be subject to price and volume fluctuations or secular declines” (cited in Hvidt, 2014:4). The Centre for Strategic and Policy Studies (CSPS) (2007:4) on the other hand argues that economic diversification represents “the introduction of a diverse array of wealth, sources of income, government revenues, export receipts and employment generation.” The definition provided here brings to the fore the broad nature of economic diversification. At its heart, these definitions centre on the fact that economic diversification leads to reduced dependence on a few sectors of the economy. The above definitions further suggest that economic

diversification may include not only economic sectors or industry, but also other sectors such as non-oil sectors.

2.4. Major Determinants of Diversification

There are a variety of conditions that must prevail for economic diversification to occur successfully. One such conditions is the need to plan strategically and the need to exercise good governance in the implementation of the plan. This is demonstrated by many African countries in 1960s-1970s that inspite of their effort to diversify their economies to reduce their dependence on staple commodities, they have failed. Their failure led them into the debt in the late 1970s and it discouraged them to further commitment in diversification (Euromonitor Research, 2010).

The UN study found that only a few countries in Africa (South Africa and three North African countries) are found to have been able to diversify their economy successfully. Dubai is considered as a successful case of economic diversification. This success has been the result of complex transformation of economic structure in consideration of its geographical location, business-friendly environment, infrastructure and efficient implementation (Callen et al, 2014). Based on the experience of African countries, the UN (2011) suggests the conditions for or determinants of successful economic diversification which they grouped into four categories – good governance, the private sector development, natural resources management and institutional capacity and human resources. For this research, the determinants of economic diversification proposed by the UN will be used in the examination of Wasan scheme. At the same time the micro-level demand-pull/distress-push factors highlighted by Bucheriender & Mollers (2006) will also be used in the interpretation of the data collected. The explanation of the factors influencing diversification is discussed in detailed below.

Good Governance

Good governance in the views of the UN (2011) is a foundation upon which effective economic diversification can start. According to the definition provided by the United Nations, good governance is about the way a country is run and so practices are participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable

and inclusive, and follow the rule of law. It includes seeking to ensure that corruption is minimized, the views of minorities and the voices of the most vulnerable groups in society are taken into consideration in decision-making in order to be responsive to both the present and future needs of society. In the context of economic diversification, good administrative practices involve giving support to weak sectors of the economy, and making sure that they can grow in an atmosphere that enables them to contribute meaningfully to economic growth. The argument is further made to the effect that in good governance, there is coordination amongst different leaders such as stakeholders, public, private individuals and institutional leaders. These actors are the executive drivers (UN, 2011) and are important in ensuring proper management of state and natural resources while the government puts in place the necessary policy and regulatory framework to guide the diversification process and ensure a healthy business climate.

Unfortunately, in Brunei the condition of this governance is weak, particularly in establishing the regulatory framework that supports economic activity. This is particularly important considering that Brunei has a weak private sector and industries heavily depend on government interventions to thrive. This implies that the government administrative machinery (public service) needs to be strong to effectively implement business-friendly reforms. The current situation in Brunei with respect to the environment for diversification is highlighted by the Centre for Strategic and Policy Studies, an institution established to advise government on matters related to socio-economic development of the country (CSPS, 2010). One of the economic diversification reports of the Centre says'

'... the environment in Brunei is unnecessarily slow and bureaucratic with respect to private sector activity. Brunei suffers from much needless bureaucracy, red-tape and slow decision-making, which kills business in a country with a very small market base.'

- CSPS (2010)

The report pointed out that the public sector of Brunei is just too large to provide room for private sector to grow. If Brunei is to promote economic diversification, according to the report, it has to:

'... find the balance between providing the necessary level of government service provision, while at the same time allowing for an enlarged private sector, ... shrink public sector

employment levels ... ensure that all regulations are reviewed and eliminated or modified where appropriate so that decision making is sped up, and the regulatory burden on private business is drastically reduced.'

- CSPS (2010)

The growing size of the public sector deprives the private sector from getting adequate human resources for the sector's own needs. The CSPS report noted that there is a relative abundance of Bruneians trained in public policy and related fields to cater to the needs of the growing public sector, and there is a lack of citizens trained in other fields, particularly management, marketing, medicine, engineering and IT. This problem of HRD imbalance is common among wealth oil export dependent countries, particularly in the Persian Gulf. According to Djavad Salehi-Isfahani (2011), these countries are using the hydrocarbon wealth to facilitate the accumulation of physical capital through foreign workers importation. He argues that this strategy is 'good for accumulation of physical capital, but not for the accumulation of productive human capital'. He pointed out that the governments of these countries find it easier to promote 'formal education than motivating individuals and families to seek globally productive skills'. The HRD situation in Brunei does not seem to be different from the experience of these countries. The agricultural programmes, for example, are not offered at various levels of education including tertiary level. The one school specializing in agriculture area (Wasan Vocational School) offers a very limited agricultural programme which is inadequate in supplying semi-skilled and skilled manpower for agricultural development. If the government continues to drive its efforts towards food production, then the capacity of training institutions will need to be improved.

The Private Sector

The UN (2011) reports that for successful economic diversification to take place the private sector must be seen to play a leading role. This proposition makes sense as many people agree that the private sector organisations are generally more efficient in delivering services to the public than the public sector organisations. In fact, the trend now is that many governments of developing countries have been moving away from using traditional approach (state-centered approach) in serving the public towards more 'business-like initiatives' (market-friendly policy environment) (Haque, 1998a; 1998b; 1998c; 1998d). In

spite of the trend in imitating private sector practices the public sector organisations are still having problems because of the inherent constraints which hinder efficient and effective delivery of services to the public. For example, in private organizations, managers (usually owners and shareholders of the organizations) have a direct monetary incentive to monitor and control their own behavior, that is, they are likely to benefit from better performance, either because they own company shares or because their pay is linked to financial success (profit). Whereas public agencies are owned collectively by members of political communities and this 'common owner-ship' leads to lower efficiency in the public sector (Clarkson, 1968, 1972).

In terms of goals, public sector organizations have 'multiple' goals imposed upon them by the numerous stakeholders which they need to satisfy. Managers in the public sector are, therefore, pushed and pulled in many directions affecting their efficiency and effectiveness in service delivery whereas private agencies have a single goal of gaining profit (Farnham and Horton, 1996). This enables them to focus their efforts solely on attaining the single goal which is relatively easier to achieve than in the case of multiple goals. One of the advantages of private sector businesses in service delivery is that they are not encumbered by the rules and regulations of merit systems (e.g. merit competition, appeals of adverse actions, etc.) and they can hire the workers they need in an efficient labor market. Furthermore, the private sector has greater autonomy to act compared to the public sector and, therefore, is more responsive to the needs of customers than can the public sector. It can invest in Research and Development by driving innovation and economic activity in under-exploited sectors to advance diversification. Private companies are in a better position to do so because they often stand at the frontier of new sectors, so long as the government is sensitive to the needs of the private sector by creating an enabling environment through putting in place measures or policies which promote the development of private sector and remove bureaucratic obstacles.

In the case of Brunei, the economy is state-controlled just like in the case of other oil exporting countries. The private sector plays a less active role in the Brunei economy because of the dampening of the spirit of investors because of bureaucracy (CSPS, 2007). Many enterprises in Brunei are categorized as small and medium enterprises (SMEs) and they lack access to capital which makes it difficult for them to fully exploit business opportunities. If

the government is to make any progress in this area it should create favourable industrial and trade policies and eliminate bureaucratic obstacles to starting businesses. Governments should be supportive of private sector development and sensitive to their needs, such as by improving the business climate through working partnerships with them. Likewise, the private sector is expected to complement government's efforts in creating employment and lead the agenda for diversifying the economy. One of the areas where employment can be generated is in the area of rice cultivation as well as in the related industries which convert rice into food products to be traded. Such trading and investment flows would pave the way for further economic diversification.

Natural resources

According to the UN (2011), natural resource endowment plays a significant role in the process of diversification in most economies. Resource endowment can be in the form of not only oil and gas, but agriculture as well. The report suggests that most countries, especially those in Africa, are unable to diversify because having natural resources reduces the motivation to develop other economic sectors which are potentially important for long term economic growth. As a result weak economic sectors remain weak and are unable to contribute to the countries' revenue significantly. The country's economy, therefore, relies solely on the revenue acquired from the natural resources.

In Brunei, the situation is no different from these African countries. Over the years, the government's reliance on oil and gas revenues has weakened the development of other potentially viable economic sectors due to improper investment and diversification strategies. The fluctuation of oil prices has made the government realised that there is a need to broaden the country's economic base to ensure sustainable growth. One of the areas that the government has identified to potentially drive economic diversification is the agricultural sector, particularly rice production. Thus, the intention of this study is to explore the level of success of this agricultural initiative. In particular, it will examine the functioning of the economic systems, the institutional arrangements such as decision-making process and consensus building, the governance structure that are affecting the rice growing initiative.

Institutional capacity and human resource

Institutions alongside human resource are enablers of the economic diversification of countries (UN, 2011). Institutional capacity is referred to as the ability of government institutions to overcome difficulties in achieving socio-economic development goals. Good governance is part of the institutional capacity needed for economic diversification to thrive which includes the ability of government institutions to make and enforce rules and laws, and plan and deliver efficient and equitable provision of public goods and services, which range from defence to education and health. Improving governance, public administrative and regulatory systems (including infrastructure) and investment in people are part of institutional capacity building. Human resources and institutional capacity together with other input factors need special consideration as their capacities act as enablers and help to facilitate trade, enhance productivity and innovation which are key drivers of diversification.

The situation of human resource and institutional capacity in the Brunei context was commented by a guest researcher (Crosby, 2007) of the Brunei Centre for Strategic and Policy Studies (CSPS). He said that because of the large nature of the public sector, the higher education institution has over produced graduates in the areas of public policy at the expense of other fields, particularly management, marketing, medicine, engineering and IT. Reviewing the curriculum of institutions of higher learning into areas of agriculture is an appropriate policy action for Brunei if economic diversification is to be pursued. Likewise, the development of skills of middle level and lower level workforce is also an appropriate diversification strategy through strengthening of post-secondary education especially in the area of paddy farming to boost the capacity of rice production and attain the needed food sufficiency desired. The guest researcher of CSPS also commented on the bureaucratic nature of government administration which hinders economic diversification. He cited delays in the issuance of visas for foreign investors, business licence, occupancy permit, import permit, as examples of some these delays. Unlike in China and other larger countries, bureaucratic delays are tolerated by businesses considering the huge local markets that make it still rewarding for them in the end despite a long waiting time to get the necessary approval. This is not the case in Brunei where the local market is small. Brunei has to invest in friendly policies to encourage foreign direct investment (FDI) and local private businesses to grow

and contribute to the economy.

Additionally, the growing size of the Brunei public sector deprives the private sector from getting adequate human resources for the sector's own needs. This situation hinders the development of the private sector and its role in diversification becomes difficult to materialise because of the competition for qualified human resources with the public sector. Since human resource is a critical factor in economic diversification it is expected that the government comprehensively plans the human resource needs at various levels of economic activities. For example, if the government is seen to be driving its efforts on food production for self-sufficiency, education and training institutions are expected to run programmes in the areas leading to the enhancement of food production. In rice farming, the human resource required is more than just providing the workforce with the intellectual ability to improve the farming practices and hence produce high crop yield. The institutions are also expected to produce lower level skills for those who are actually working in the rice field. A workforce with higher level skills would naturally want to work outside the rice field. A balance will have to be made between producing high/professional level graduates by universities and middle as well as lower level skills by post-secondary institutions.

2.5. The Case of Gulf Cooperating Council (GCC) States

The Brunei government's programmes in the promotion of rice production bear a close resemblance in many respects to agricultural development programmes pursued in the Gulf Cooperating Council (GCC) states. The GCC is a union of Arab states which was formed in 1981 with the purpose of strengthening members' political, economic and social ties through harmonization of regulations in various fields including economy, finance, trade and customs and exploitation of the economic and political resources. The GCC countries are made up of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates (Hvidt, 2013). These countries have a total population of just over 40 million people but about 40% of their workers are from outside the region (Shah, 2010). This region is known to be one of the richest on the Asian continent as the member states are blessed with natural resources.

These natural resources have helped GCC countries to achieve high levels of income and enormous improvement in the standard of living for locals, in comparison to the poverty

prevailing prior to their exploitation (Sadik, 2013). However, while these countries have abundant resources of energy and gas, they do not have a comparative advantage as a result of low rain and high temperatures (Bailey and Willouby, 2013). Their arid climate and the scarcity of water does not provide the necessary impetus for agriculture farming. Hence, they are faced with a major challenge of water insecurity and food deficiency (Shah, 2010; Sadik, 2013). It is, therefore, expected that GCC countries will have to rely on imports for food consumption (Koch *et al.*, 2008). According to Initini *et al.* (2012) cited in Weerahewa, *et al.* (2015) food imports make up 60-90% of food consumption in the GCC countries. The problem of food insecurity is expected to be greater in the future as the population is expected to reach 53.4 million people by 2020. At least one-fifth of the population in Bahrain, Oman, Qatar and Saudi Arabia is estimated to be food insecure according to this source. Bailey and Willouby (2013) maintain that GCC countries have two potential risks; supply in terms of the availability of food imports and price risks regarding the affordability of food imports.

The 2007-2008 period saw food prices triple in most countries around the world, including the GCC countries. The increase in the prices of major food crops was the result of complex interaction of many economic situations including the diversion of food crops to the production of biofuels, the speculative behavior in commodity markets, the shift of investment and hedge funds into commodity markets in response to real estate bubble burst in mid-2007 and the rising living standards in China, India, and other developing countries (Saif, 2008). In response to the soaring domestic food costs, India, the third largest exporter of the grain banned the export of non-basmati rice at the same time raised the price for exports of aromatic basmati rice to discourage exports. This situation put the GCC countries on high alert as over 50 percent of rice needs are imported from India and over one third of their rice needs are imported from Pakistan (Woertz, 2008).

This means that their food security is in a vulnerable position due to disruption in the world food market. Shah (2010) points out that these countries are now left with a decision to either enhance domestic production or to secure food import supplies through international agricultural investments in other countries. Beyond the 2007-2008 global food crisis specifically, GCC countries have longer-term problems of cropland and scarce water resources which limit agricultural production. These limitations will result in GCC countries

continuing their unhealthy dependence on rice imports (Sadik, 2013). According to the report from the Economist Intelligence Unit Sponsored by the Qatar Financial Centre Authority in 2009 (Outlook for the Gulf and the Global Economy, 2009), GCC spending on food imports is projected to increase from US\$24bn in 2008 to US\$49bn by 2020. An important reason for this growth in imports, according to the report, is water scarcity which will make domestic agricultural production costly. Other policy options will thus need to be considered, such as purchasing agricultural land in regions such as Africa, Central Asia and Southeast Asia, for strengthening their food security.

Kotilaine (2010) confirms that the agricultural sector of the GCC nations does not represent a significant component of their economies because of the arid climate and low capital investment. Agriculture sector, he says, only accounts for 1–4% of the nations' GDP inhibiting its contribution to GDP and employment. Because of the rising cost of food and growing food consumption of the population, agriculture remains as an emphasis in GCC countries although agricultural activities, in particular food production, are likely to result in low self-sufficiency. As a result of the problems associated with local food production, GCC countries are shifting their agricultural policies away from self-sufficiency towards a broader conception of food security (Woertz *et al.*, 2008; Alpen Capital, 2013). Nevertheless, the agricultural sector remains important to Oman and Saudi Arabia. About 35% of economically active population of Oman and 9% of Saudi Arabia are being employed in this sector.

The problem of availability of renewable water for agriculture in GCC countries is highlighted by Koch *et al.* (2008). They note that irrigated agriculture in GCC is estimated to last for at most 30 years. The estimation of the 30 years of irrigated agriculture in GCC in the view of the authors is based on an annual water withdrawal ratio that also takes into account the water recharging ration. The authors further reveal that agriculture in GCC countries requires about 80% of the total water supply. This means only 20% of water will be utilized by other competing sectors, such as the industrial sectors which will find this ration inadequate. This is likely to create competition and the cost of water for the foreseeable future is likely to increase. The Economic Intelligence Unit (2010) confirms that in GCC countries, demand for water far outstrips supply. They conclude that the likely outcome will be food insecurity.

Other literature also reveals that there are further factors contributing to low food security (food sufficiency). One of these factors is the population increase in member states of GCC (Koch et al., 2008; Apen, 2013). The population growth rate of GCC countries is about 2.4% annually, which is well above the global average of 1.1%. Although birth rates are observed to be relatively low, GCC countries attract large numbers of foreign immigrants. The high population growth rate as well as the countries' wealth have contributed significantly to increasing demands for food, thereby leading to low food security. Apen (2013) further argues that since the world food consumption is moving from carbohydrate staple-based food to protein-rich diets, such as meat and dairy products in which GCC nations are leading, he believes that this change in the dietary patterns can contribute to low food sustainability and security by affecting the prices of food.

It should be noted that the case of GCC countries is not the same as the case of Brunei. First, its population figure and population growth rate are not high. Second, Brunei is not located in an arid region of the world which means that scarcity of water is not a major challenge. It can be argued, therefore, that the issue of diversification or food sufficiency or security in the Brunei context has the potential to be addressed. While GCC countries are facing fossil groundwater depletion (Saif, Mezher, & Arafat, 2014) such as what is happening with wheat growing in Saudi Arabia, Brunei does not have to deal with the non-availability of water supply. The Brunei economic diversification case could be a useful study to add new knowledge to already available knowledge on the subject, especially when framed around the cases of other countries. If progress in diversification efforts is to be made in the study of wet-rice agriculture, the case study of *Wasan* should provide specific information on the areas to work on for further improvement.

2.6. Factors Affecting the Success of Economic Diversification Efforts

Oil rich nations have realised the danger of relying too much on a single or a few sources of revenue for the country, as it does not guarantee the country's economic stability and sustainability in the long run. One way to ensure long term economic stability is through economic diversification which involves introducing wider and more diverse sources of wealth, government revenues, employment generation through economic diversification

activities. However, many countries have not been able to widen their economic-base fully or according to expectations for greater economic stability due to certain factors.

It is interesting to note that countries associated with ‘enclave economy’ may also have the problem of not being able to diversify their economies. Enclave economy refers to the development of an economic activity typically developed by foreign investors in manufacturing products for exports (Dontigney, 2017). Jalisco state in Mexico can be cited as an example of an enclave economy, where U.S. technology companies have invested heavily in high-tech manufacturing activities. While the host governments involved in enclave economies hope for the rest of the economy to be developed as gains from foreign direct investment, in reality this does not happen because foreign companies take away highly skilled people for their own needs. Also, the profit from such economic activities goes back to the investing countries and they often kill domestic companies by driving up prices of domestic raw materials. As a result, the host country receives minimum economic gains from such activities.

Various views have been expressed on the factors hindering successful diversification. Gelb (2010), for example, has observed that the variations in the quality of institutions play a significant role in determining the growth of oil rich nations and non-oil rich nations. He argues that countries with a strong institutional foundation have the potential to diversify their economies than countries with weak institutions. The author admits that, unfortunately, most resource rich economies have weak institutions that undermine the potential for economic diversification. The worldwide governance indicators of oil producing countries depict that most oil producing countries have institutional scores that match that of poor countries. This observation is consistent with the idea of the United Nation that countries with natural resources need to divert the countries’ income to other weaker sectors of their economy, which are potentially important for long term economic growth and to develop institutional capacity for diversification to thrive.

Sekwati (2010) observes that in resource dependent nations there is usually a poor link between the key export resources and other sectors of the economy. As a result, the nations continue to depend on the revenues generated by key export resources, while other sectors of

the economy remain weak. She suggests that three factors are required for diversification to thrive; namely firm political commitment, consistent public policies and substantial financial resources. Sekwati's observation makes sense especially on the poor link between the dependent resource and other fledging or weak sectors. This observation is consistent with the United Nation's idea that income gains from natural resources need to be channelled to the development of the weak economic sectors for economic stability.

A relevant question to ask in connection with Sekwati's important factors for diversification to thrive has to do with countries which remain in a stagnating process, albeit putting in enough political commitment, strategies and resources into the process of economic diversification. It is hoped that this study will contribute to providing answers to this scenario. At this point, what is clear is that the factors for successful diversification mentioned by Sekwati are not necessarily different from or conflicting with the factors put forward by the United Nation discussed earlier (section 2.5). Whereas the factors stated in the United Nation document can be seen as macro-level (bigger) factors, the factors specified by Sekwati can be seen as micro-level (specific) factors. Sekwati's factors can, thus, be also seen as supporting or supplementing the factors stated by the United Nation. For example, the factor 'firm political commitment' is linked with 'good governance' (United Nations) in the sense that there will be no good governance without political commitment. Likewise, Sekwati's factor on 'consistent public policies' is associated with 'institutional capacity' (United Nation), particularly the capacity to formulate and implement government policies in terms of content thrust and time dimensions. The factor 'substantial financial resources' is a general requirement for any policy/ programme to be implemented. This is consistent with the idea of the United Nations that revenue gains from natural resources should be channelled to the development of weak economic sectors, which have the potential to contribute to economic stability.

Other authorities in examining the factors affecting diversification have looked at these factors in terms of typologies of diversification (Buchenrieder & Mollers, 2006). They indicate that the demand-pull/distress-push employment concept which was used by Everett Lee in 1966 to explain the migration dynamics can also be used to explain labour shifts from agriculture sector to the rural non-farm sector in the context of diversification of non-farm

activities. The demand-pull employment is the process whereby people in the agriculture area seek lucrative opportunities in non-farm rural employment. The distress-push employment, on the other hand, reflects a condition where insufficient income and other negative conditions in the farm activities push people into poorly paid non-farm rural employment (Bucheriender & Mollers, 2006).

The authors explain that these terms refer to the shift of households or families from employment in agriculture activities to rural non-farm activities (Buchenreider & Mollers, 2006). The movement into and from agriculture determines to a large extent whether diversification will succeed or not. This framework for understanding the shift of families to non-farm activities is useful for the current study as it reveals the behaviours, or set of characteristics in people, that are responsible for the shift of employment from agriculture based farm activities to non-farm activities. According to the authors, demand-pull factors facilitate diversification processes, although they may not be sufficient to initiate them. For diversification to occur, according to them, the presence of the distress-push factors might be necessary. Table 2.2 explains the concept of demand-pull/ distress-push factors which determine the growth of non-farm activities (diversification).

	Factors associated with the traditional agricultural sector and the household	Factors associated with the rural non-farm sector including the external constraints
Pull Factors	<ul style="list-style-type: none"> • Educational level, skills, knowledge • Positive attitude towards working and/or living in town • Existence of social networks facilitating diversification by reducing cost 	<ul style="list-style-type: none"> • higher wage rate in non-farm sector • labour demand in non-farm sector • optimistic rural business environment • appropriate infrastructure, e.g. road, schooling and vocational training network • information availability • efficient land and credit market • existence of rural development plans/projects/programs
Push factors	<ul style="list-style-type: none"> • Insufficient access to land and low land productivity, small farm size • Low farm labour productivity • Lack of self-financing capability for farm investments • Inefficient land and credit market • Large family size with many dependent family members • Negative attitude towards farming and rural livelihoods • Generation conflict • Natural disasters, shocks 	Constraints to distress-push diversification: <ul style="list-style-type: none"> • Less favoured market structures and high unemployment rates • Lack of infrastructure • Inefficient institutions • Legal and cultural barriers, norms • Lack of livelihood capital assets

Table 2.1 Demand-pull and distress-push factors determining non-farm activities

Source: Moller, 2006 cited in Buchenreider & Mollers, 2006

Furthermore, Efstratoglou-Todoulou (1990) highlights that demand-pull diversification occurs when families engaged in farming activities are pulled from farm activities towards

non-farm activities. In other words off-farm activities take centre stage rather than the farming activity itself. This may happen because of the low financial rewards in the farming sector. It may also be caused by the presence of other opportunities more rewarding than the farming activity itself. According to him, the distress-push factors occur when households are motivated to be engaged in non-farming endeavours because of low income. To supplement their income from farming activities, they work part-time as employees in the non-agricultural enterprise. The people who get into diversified employment do so because of financial reasons. They also often accept wages or returns even lower than the earnings from farm and agricultural activities, as their only objective is to increase the household income. In transition countries (countries which move from centrally planned economy to market economy), distress-push diversification is more prominent as people aim to gain additional household income (Moellers & Heidhues, 2003; Chaplin et al., 2004).

However, the use of the demand-pull/distress-push concept in the current study can be seen as inappropriate or irrelevant because it contradicts the development direction desired by the Bruneian government. This direction is towards a more diversified economy away from a total dependence on oil and gas. The government sees that agricultural sector is one promising solution for economic diversification. This necessarily means that people working in farms should remain in farm activities to contribute to the economy within the agricultural sector.

So, more people need to be involved in farm activities if the agricultural sector is to be successful. This means that the demand-pull/distress-push model, which proposes enhancing demand-pull factors and reducing distress-push factors, cannot be followed as it supports successful diversification by having families—already engaged in farming activities—pull themselves towards non-farm activities. If this concept is applied in the Bruneian context, agricultural activities will decline over time which is against the desire of government to promote agricultural contributions to the economy. In other words, economic diversification is less likely to succeed if Bruneians move towards non-farm activities.

This contradicting or conflicting set of policies can be found in most governmental action. For example, aims to promote the growth of the private sector are hindered by the expansion

of the public sector. Moreover, the positive provision of welfare to its people should not encourage their increasing dependency on the government. Another example are comprehensive regulations governing the operation of the private sector that must be careful not to slip into over-regulation, which intensifies bureaucracy and slows down efficiency and effectiveness.

Thus, for successful diversification to occur, developments in the agricultural sector do not have to be traded off. The solution is to find the right balance. Even as the demand-pull and distress-push model has its weaknesses, it can still be used in the analysis of the *Wasan* Scheme. This micro level analysis can be of value in understanding the dynamics of rice farming in the Bruneian context, which pave the way for possible recommendations as the output of the study.

2.7. Food Security

The concept of food security has been a multi-faceted one reflecting the change of thought in policy makers (Clay, 2002; Heidhues et al, 2004). Among the official definitions for food security by international organizations, such as the World Food Summit (WFS, 1974), is:

“Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices”.

This was later expanded by the Food and Agricultural Organization (FAO, 1996) which defined food security as,

‘all people, at all times, cause physical and economic access to sufficient, safe and nutritious food to satisfy their dietary needs and food preferences for an active and healthy life’.

This concept of food security entails that certain elements need to exist, namely availability of food, food use and stability.

However, Brunei’s Department of Agriculture and Agrifood (2009a, 2009b) and Department of Town and Country Planning (2009:3) defines food security in relation, and in most cases as interchangeable, with food self-sufficiency. Although food security can be achieved via imported food—as WFS and FAO do not mention any preclusions to adequate and all-round accessible food supply in food imports, long-term self-sufficiency in food supplies has been

inextricably integrated into a definition of food security in Brunei's policy documents. As such, the Department of Agriculture and Agrifood and Department of Town and Country Planning can be seen to focus on national production (or self-sufficiency) as a measure of food security, as they assume that imports may meet with uncertainties or interruptions due to unanticipated global problems.

2.8. Summary of key findings of literature

In this chapter, the researcher has reviewed selected literature on the topics related to the problem areas under investigation, as reflected in the research questions. The key findings of the review are summarised below. The utilisation of these findings in the present study is also explained under each key finding.

Indicators of Extent of Economic Diversification

The literature reviewed reveals that the following indicators can be examined to indicate the extent of economic diversification. For example, the higher the employment rate generated by the *Wasan* Scheme, the greater is the extent of economic diversification.

- a diverse array of wealth
- sources of income
- government revenues
- export receipts
- employment generation

The above information, to some extent, was used to collect data with respect to the *Wasan* Scheme. It also served as a guide in the categorisation of the interview data.

Conditions Influencing Economic Diversification

Based on the report of the United Nations (2011) at least four conditions must prevail for economic diversification to thrive or survive.

Good governance involves supporting the weak sectors of the economy (e.g. wet rice farming). It also involves coordinating executive drivers (public, private individuals and institutional leaders) in the management of state and natural resource and in placing the

necessary policy and regulatory framework to guide the diversification process. The contribution of the *Wasan* Scheme to economic diversification involves finding out whether or not this condition exists in the *Wasan* Scheme.

The private sector must be seen to play a leading role if economic diversification is to be encouraged. It should complement the efforts of the government to create employment and generating revenue through import-substitution and exporting activities. The contribution of the *Wasan* Scheme to economic diversification involves finding out whether or not there is any friendly investor policy being instituted to encourage Bruneians in rice farming, such as tax exemption. The current study also examines whether employment is generated, and if there is any increase in rice yield (productivity/profitability, etc.).

Natural resources availability, such as revenues generated from oil and gas, should be capitalised by developing other weak sectors and enhancing the government's ability to channel resources from well-performing economic sectors to other weaker sectors, such as rice farming, so that they can contribute to economic growth. The contribution of *Wasan* Scheme to economic diversification involves finding out whether or not adequate resources are invested for the development of wet rice farming, i.e. resources provided to *Wasan* Scheme.

The enablers of economic diversification—institutional capacity in areas of law making and enforcement, public administrative and regulatory systems, and investment human resource—should be continuously reviewed and improved. Research and Development should be instituted and resources should be provided so that other sectors also get the innovative input needed to contribute to the economy. The contribution of *Wasan* Scheme to economic diversification should, thus, also be assessed based on institutional capacity and human resources development provided by educational and training institutions.

The points presented above represent the key findings of the literature review and they were used to establish a conceptual framework for the study (see Figure 1.3). This framework was used as a guide in assessing the *Wasan* Scheme and the development of interview guides. It helped to provide categorisations for organising interview responses in the data analysis. It

was also used to guide the development of a questionnaire which served as an instrument for reducing the interview data into 'key findings,' and assessing the degree of consensus of the respondents in these findings.

CHAPTER 3

Brunei's Economic Diversification into Wet Rice Agriculture

3.1. Introduction

This chapter provides a brief overview of the history, politics and economy of Brunei, including the history of economic diversification. Since agricultural policy development is influenced by the social, political, economic and cultural context of the country, a detailed description of such context is important for understanding the nature of the case (*Wasan Scheme*) in its natural setting. An evolution of government rice farming policies since the early 20th century is also discussed based on a review of the available literature on the subject (see e.g. DAA, 2009a; DAA, 2009b; Department of Town and Country Planning, 2010). This discussion will provide a background to understanding why Brunei places much significance on the development of wet-rice cultivation as part of its agriculture and agri-food strategy to ensure food security, and enhance the contribution of agriculture to the GDP. Thus, it will provide an assessment of the status of rice agriculture as part of the country's strategies for economic diversification. It will do so by applying the additional theoretical framework of rentier states (introduced in chapter 2) to arrive at explanations for its limited success.

3.2. Location, Population, and Government

Brunei Darussalam is the smallest (5,765 sq.km) of three countries, along with Malaysia and Indonesia, that occupy the island of Borneo, with a tropical equatorial climate characterized by high rainfall throughout most of the year (relatively dry from January to September and wet for the rest of the year, with rainfall averaging 2900 mm/year). It has a population of 411,900 in 2014 with a 1.4% annual growth rate, comprising 72% locals and the remaining foreigners, expatriate or guest workers who are mainly Malaysians, Filipinos and Thais (DEPD, 2015). The country is divided into four districts namely Brunei-Muara (the administrative and financial centre); Tutong; Kuala Belait (oil and gas), and Temburong Districts (see Figure 1.1).

The unique context of Brunei's political system may be described as a neo-traditional state

(Anderson, 1991, in Talib, 2016), where the monarchy continues to rule the nation, even though it has adopted the Westphalian model of a nation state since gaining independence in 1984 (Musa, 2006). Traditional institutions further strengthen and give legitimacy to the adoption and promulgation of *Melayu Islam Beraja* (MIB, or "Malay Islam Monarchy") as a national philosophy. MIB, which subscribes to the notion of looking to His Majesty the Sultan as the leader towards national prosperity in accordance with traditional Malay and Islamic values, is socialised into all government policies, programmes, procedures and events, as well as being apparent in rules and protocols governing social interaction. As such, the citizenries continue to live as subjects who look to the ruler for leadership and guidance, while not expecting to be engaged in policy- and decision-making processes. Society, including the middle-to-lower echelons of Government, is generally not familiar with many secular laws and the country's constitution, which was drafted by the British in 1959. These modern institutions designed during the colonial period have not been responsive enough to the changing demands of the society and slow to deal with the globalization forces impacting the country. Instead, the society and the government, to a large extent, tends to follow traditional institutions and norms as guides in the modern world where two incongruent systems co-exist.

Society mainly comprises serving loyal subjects—a situation reinforced by a welfare state system made possible by the nation's abundant oil and gas resources and manifested in the governmental programmes introduced, but not well-established. As widely acknowledged by international development aid programmes, Brunei's situation is common within developing states where an emphasis is placed on "capacity building" (see, e.g. Commonwealth Secretariat/World Bank, 2000). Such a focus is largely due to the governmental structure that was introduced by the colonial powers, which is no longer suitable for a modern globalised world in the late 20th and 21st centuries. Furthermore, efforts in reforming are progressing slowly. Lack of technical capacity entails a reliance on international consultants to develop national programmes and masterplans that have been partially or poorly implemented thus far.

3.3.Brunei's economy

Brunei's economy is characterised by two sectors, oil and natural gas and non-oil sectors.

The oil and natural gas sector accounts for over 60% of GDP since oil's discovery in the late 1920s, and was initiated by a 50/50 joint venture between Brunei Government and the Royal Dutch Shell (DEPD, 2015; Siddiqui & Al Athmay, 2012). Hydrocarbon resources have been the major export since the early 1960s. This sector has emerged as the dominant economic sector. In fact, wealth from hydrocarbon resources has enabled the country to provide economic prosperity to its citizens in terms of the provision of numerous free or heavily subsidized public services and goods. Income derived from this industry has enabled the inhabitants to enjoy the highest standards of living in Asia with a per capita GDP of BND\$52,614 in 2014 (DEPD, 2015). The country has no personal income tax. Medical services and education are free for its citizens, and there are significant subsidies in food and housing amongst others. Due to these benefits, Brunei enjoyed a High Development Index (HDI) of 0.856 in 2015, where the country ranked second in the South East Asian region, top ten in Asia and Oceania, and 31st out of 188 countries (UNDP, 2015).

Brunei has placed a substantial portion of its savings and wealth in the Brunei General Reserve Fund (with an unofficial estimate of at least USD\$30 billion, e.g., Morgan Stanley, 2007; Sovereign Wealth Fund, 2015) in overseas investments (e.g. United States, Western Europe, Japan and Association of South East Asian Nations (ASEAN) run by the Brunei Investment Agency (BIA), which manages 35% of its overseas investments directly (Bagnall & Truman, 2013).

3.4.Brunei's Diversification Drive

It is largely undeniable that Brunei has a unique economic environment in Southeast Asia, because its creation of wealth and income is mainly dependent on its oil and natural gas assets. This industry generates considerable revenue for funding the government's economic activities that enable high standards of living within the country. As a result, Brunei can be characterized as a "rentier state," or one suffering from the "Dutch Disease"— considering its high reliance on revenues from the oil and gas industry bloats the public sector, while taking on non-productive social expenditure (Gunn, 2001). The political and economic characteristics resemble that of small Middle-Eastern / Gulf oil exporting countries like Qatar, Bahrain, Oman and the United Arab Emirates (Tisdell, 1998). All these countries share

a common goal to diversify their economies away from oil and gas.

The need to diversify has been a recurrent objective since the government of Brunei stressed this in the 1960s. At the initial stage of Brunei's drive to diversification, a particular emphasis was placed on the development of non-oil, agricultural and industrial sectors as stated in the Second National Development Plan (1962-1966). Only later was this expanded to include the service industries, such as financial services, transport and tourism.

Despite going through ten NDPs, the emphasis on diversification remains because it has met with little success (see Duraman, 1994; Rosnah, 2008; Duraman & Hashim, 1998; Yunos, 2009 and Lawrey, 2010 for assessments of the extent of achievement of the objective of economic diversification). Firstly, low productivity hindered the growth of a competitive industrial sector as the public sector remains the preferred employer. Employment in the public sector remains high with 38.9% of Bruneians employed in the public sector in 1971; 46.6% in 1981 and 45.9% in 1991 (DEPD, 2015). Examined from this perspective, it was understood that Brunei should go through a transition to overcome the problems of rentier state as highlighted in Chapter 2, Section 2.2.3. The problems of rentier state political economy is that the government's primary concern is the creation and protection of local job opportunities for a select group of citizens who are exclusively given small plots of land for rice cultivation. This rentier state situation (displayed by GCC states too) creates a paradox wherein the government advocates economic diversification through national efforts and policies and yet, in practice, they end up creating a new channel to distribute oil and wealth to various groups of local people instead. In this respect, the rentier state undermines genuine efforts to diversify away from oil and gas and attempts to gain food security through food self-sufficiency.

Brunei made some progress in creating new sources of economic growth besides oil production. There was an increase in the contribution by the non-oil sectors from \$695 million in 1980 (the last year of the Third NDP) to \$962 million in 1985 (the transitional year) to \$1,337 million in 1990 (the last year of the Fifth NDP). This progression resulted in a reduction of national dependence on the oil sector, from 83.7 percent in 1980 to 72.8 percent in 1985 and 68.5 percent in 1990 (DEPD, 1991). However, the public sector still accounted

for most of the major economic activities in the non-oil sector expansion. In the non-oil private sector, only the service sectors (wholesale, retail trade, business services and finance) performed well with minimal growths in other areas (Siddiqui & Al-Athmay, 2012).

Therefore, it becomes clear that there has been meagre success in attaining the goal of economic diversification stated in the NDPs. Subsequently, it is worthwhile for policy-makers to revisit the concept of economic diversification from its base to align the rules of diversification with the goals being pursued. One of the common lapses of the NDPs is their vagueness as to how exactly to achieve targets and the specific duration of each specified target. Therefore, narrowing the focus to one or a few specific issues at a time, such as agriculture (rice cultivation) and its planning and implementation will be an uphill battle from a purely economic standpoint as it seems that the rationale mostly stems from the mixture of agricultural development goals (e.g. economic diversification, food security and employment etc.). As the NDPs mention economic diversification time and again, it is important to assess Brunei's performance, or lack of, in this regard. The proceeding section examines Brunei's performance levels at economic diversification.

3.5. Rice Farming Policy and Development

The basic issue—that presents Brunei with a true conundrum—is that the nation has been trying to increase rice production for almost 100 years but has received very little success in spite of the length of time it has spent devoted to gaining improvement. This limited success was attributed to a multitude of factors, namely adverse weather conditions (LegCo, 2013), insufficient areas of land developed for rice agriculture, insufficient irrigation, unsatisfactory yields by farmers (Khaleddi, 1996) and absence of hired help (Bayan, 1989; Rosini, 1998) to name a few. In terms of erratic weather, heavy bouts of rain had destroyed crops, causing serious occurrence of pest and crop infestation. With regard to insufficient land, Brunei has a total land area of 5,765 square km where only 1,355 ha are currently used for growing rice. About 88.4 percent of the country's total land area have been committed and earmarked for various land users and development projects whilst 11.6 percent remain available for future development. The used land comprises forest reserves and other forests 80.0 percent, urban and residential areas 2.6 percent, agricultural land 4.5 percent, gravel and white sands deposits 0.6 percent and other uses 7.0 percent (6th NDP). Although there is still a large

amount of land available to accommodate the physical growth requirement to the year 2005 and beyond, it will be difficult to commit those land for development as they were impeded by locational and suitability constraints. These constraints include more than 50.0 percent of private land have no access and services or are within the proposed conservation area, best developable state land are fragmented in size and location as well as large tracts of available state land are prone to the risk of serious environmental damage and are costly to develop. The following section will examine government efforts in rice cultivation prior to independence and post-independence.

3.5.1. Past Government Efforts (Pre-1984 Independence)

It must be noted that owing to an increase in the value of rice imports and a resultant pressure on government budget, programmes were introduced as far back as the 1920s to encourage the cultivation of wet rice that is both high-yielding and free from environmental degradation. Among the programmes initiated was the setting up of the Agriculture Research Centre in 1927. The Land Code in 1928 was put in place to prohibit the felling of either virgin jungle or *belukar* (secondary jungle) over 10 years old. In 1929, a program of research was conducted on the compatibility of rice seeds introduced from Malaya (now known as Malaysia). The interventions resulted in mixed outcomes. A positive consequence was the expansion of rice acreage in the 1920s in Tutong and Belait Districts. But, this production did not meet the country's national requirements, which meant that rice was imported to cover the shortfall. In 1921, 900,592.52 kg of rice was imported and this figure increased to around 2,419,159.3 kg in 1927. Rice production increased from 1,078,000 kg in 1923 to 1,540,000 kg in 1926 mainly due to the introduction of wet rice agriculture. So widespread was the earnings for households in growing wet rice varieties that increasing number of people were attracted to agriculture (specifically, rice farming). However, in 1927, rice production dropped to 1,050,000 kg due partly to the frequent occurrence of heavy rain throughout the rice planting season. The traditional nature of land preparation could not withstand constant flooding of rice fields. Horton (1998) reports that the drop in rice production may have also been attributed to Bruneian Malays (the main ethnic groups in Brunei) lack of an agricultural tradition, as they lived over water at *Kampong Ayer*. Furthermore, principal local farmers, the *Kedayan* (one of the seven Malay ethnic groups in Brunei) failed to produce surpluses in

their small rice farms. Thus the country failed to be self-sufficient.

During the First and Second World War, Brunei was already highly import dependent as it was only able to produce between one-third and one-sixth of its own rice consumption (BAR, 1931; BAR, 1934). Brunei's import dependence has not always been the case. Before 1811, Brunei was one of the states on Borneo island that cultivated enough rice for its own consumption (Leyden, 1837: 95 in Horton, 1998: 87). It is thus surprising that—even with consistent, sustained and devoted efforts by the government to push for self-sufficiency—Brunei has not been able to expand its local production to more than forty percent of its domestic requirement. While there was a slight increase in the size of total acreage for wet rice cultivation, economic necessity persuaded more people to take up rice farming in the 1930s. The area under rice cultivation in Brunei expanded from 3035.1 ha in 1930 to more than 4856.2 ha in 1932 (BAR, 1932). In 1931, there was an increase in the size of total acreage for wet rice agriculture attributed to the fall in the price of rubber. Consequently, rubber plantations were converted to planting rice. At this time, rice production had increased from 1753069.5 kg in 1930 to almost twice the amount, around 3,583,860 kg in 1933 from more than 4856.2 ha of land (BAR, 1934).

In line with the policy to encourage farmers to wet rice agriculture, the government of Brunei provided favourable terms in the form of (i) lower land rental charges, (ii) rights to owning the land and (iii) establishment of minor drainage and irrigation. The land rental was charged to wet rice farmers at the rate of 40 cents per acre compared to 50 cents for dry rice cultivation in 1937 and then increased to \$1 per acre in 1939 (BAR, 1937; 1938). After five years of cultivating wet rice, the farmers received rights to the land that was formerly on temporary occupation license (TOL). Conversely, farmers cultivating hill rice were not given any land rights and remained cultivating rice on TOL land. As a result of these incentives, total acreage under wet rice in Brunei at the end of 1939 was estimated to be approximately 5,000 acres, of which some 1500 acres were issued as TOL (BAR, 1937; 1938).

Moreover, provision was made by the government in 1939 for the establishment of minor drainage systems. Additionally, irrigational schemes opened up new areas for wet rice agriculture and assisted in perking up existing areas (BAR, 1937; 1938). Such initiatives were taken by the government because one of the main factors militating against the planting of wet rice in Brunei was its deep swampy lands on which wet rice could not be grown successfully. Until drainage conditions are improved, the only method to cultivate rice was to use buffaloes to trample the fields.

The use of buffaloes for ploughing was necessary as farmers could not afford to buy tractors. In early 1939, the Wetland Housing Scheme was initiated to encourage Bruneian Malays who were mostly living along riverine areas to cultivate rice. This scheme was warmly received. The three locations of *Sengkurong*, *Pirasong* and nearby *Sungai Brunei* were allocated. As a way of encouraging people to plant rice and move to these areas, they were provided with free land, free seeds, and a limited number of buffaloes. Drains were also created, and demonstration plots were laid out.

The outcome for each of these locations differs significantly. While the *Sengkurong* Scheme failed with only 30 acres out of 200 allocated acres used, the *Pirasong*¹ area was much more encouraging with 70 acres of land used for planting. Overall, there was an expansion in areas for wet rice cultivation and, subsequently, a decline in dry rice cultivation. The average rice import in this period amounted to approximately 2,700 tonnes per annum, as half of the total national requirements for rice was produced within Brunei in 1938-39 (BAR, 1938; 1940).

Throughout the 1940s, a number of important events ensued that encouraged wet rice cultivation. One of them was the opening of land resettlement scheme at *Mulaut* for the purpose of wet rice cultivation, which for a while increased rice production. Regrettably, this was disrupted as a result of the Japanese Occupation (1942 to 1945) of Brunei. Rice grown by locals was confiscated by the Japanese occupiers, which resulted in a severe famine among Bruneians. Malnourishment and a low supply of medicine also caused Bruneians to get easily infected by malaria (Horton, 1998). In order to revitalize rice planting activities affected by

¹ Here, settlers came from a different part of the river kampong (or village).

the war, the Government of Brunei introduced an agricultural programme in 1946 known as “Grow More Food.” One of the activities was to plant rice on 50 acres of land with rice seeds supplied by the *Kilanas* Research Station. Around 60-70 labourers from the Island of Jawa, Indonesia, were hired by the government of Brunei to help prepare the land for planting. Prior to the harvest, all hired labourers were sent home to be replaced by local labour. This led to a notable expansion in rice acreage for wet rice and a decline in dry rice in 1947. Furthermore, dry rice was simultaneously discouraged as it involved moving between lands and, thus, lead to land wastage. However, these national schemes were not sufficient to revitalize rice farming activities. Despite small developments in wet rice cultivation, dry rice drastically declined and both continued facing stiff competition from oil and gas industry.

In the 1950s, there was a sudden surge in support for the *Mulaut* wet rice resettlement scheme. A similar scheme was, consequently, opened up at *Bunut* for *Kampong Ayer* residents (*Bendahara Lama*) in 1952. Improved planting methods were one significant part of the national development plans of 1957. However, there was a general decline in the areas under rice cultivation, production and number of rice farmers due to a combination of factors. These factors include flood, drought, heavy rain and a competing attraction to work for the Public Work Department, construction, and the oil and gas sector.

In the 1960s, despite the emphasis placed on rice agriculture as part of the economic diversification strategy, Brunei still produced little with a further decline in rice acreage and production. Based on the 1960 Census, 900 farmers were cultivating wet rice on 5,000 acres of land. Out of this total acreage, 60% owned less than 5 acres and 85% owned less than 10 acres. Also, during the 1970s, the occurrence of the global food crisis wreaked havoc on all countries, including Brunei, despite its bilateral agreement with Thailand, a rice-exporting country. The impact of the global food crisis on Brunei was two-fold. In dealing with the food crisis, Thailand had restricted all rice exports to Brunei by mid-1973. In an effort to secure sufficient stock for Brunei’s domestic consumption, Brunei State Store (BSS) for the first time bought rice from China through the private sector worth 6,000 Mt of 25% grade. In May, the retail value increased from \$1.80 to \$2.20 for 2.54kg and, by September, to \$3.00 per 2.54kg. The actual price of rice was higher, but due to huge government subsidies the price of rice sold in Brunei remained constant, i.e. at a fixed price of B\$12.50 for 10kg of

fragrant rice. About the same time, the Government increased the purchase price of local rice from \$0.80 to \$1.20 for every 2.54kg. However, only 2 tonnes of local rice were sold by rice farmers to the government. Additionally, because of better incentives offered by the oil and gas sector, the situation was compounded by a severe lack of interest in rice farming. All these factors contributed significantly to expose Brunei's vulnerable dependence on food imports. Subsequently, in an effort to reverse the declining trend and regain Brunei's rice production potential, further initiatives were implemented that include:

- 1964: 13 Farmers Co-operatives in Brunei-Muara and Tutong District were developed.
- 1967: Rice fertiliser subsidy scheme was introduced and high-yielding rice seeds were given free to rice farmers.
- 1969: Increasing the test plots status at Labi, Lumapas and Luahan to Agricultural Stations.
- 1971: Half price subsidy on fertilisers and half-price rental charge on tractors to farmers.
- 1974: Introduction of Investment Incentives Enactment and the establishment of the Economic Development Board to facilitate the development of agriculture and industry.

Brunei's Third NDP (1975-79) states that rice farmers were producing only between 20 to 25 percent of domestic requirements. As a result, the government introduced several initiatives to encourage small-scale agriculture, including rice cultivation. Among them were to provide loan-financing schemes, first introduced in 1977, and opening up *Wasan* for large-scale rice projects that covered 600 hectares of land. However, this project failed to meet its objectives, as *Wasan* was only able to cultivate half of the total land. Despite, and precisely because of, this significant failure, the objective of diversifying the economy through agriculture, including rice cultivation, continued to be emphasised in the Fourth NDP (1980-1984). During this period of pre-independence (1920s-1983) politically Brunei government has limited power as the British residents are responsible in advising the sultan on all matters of administration except those concerning the Islamic religion. This was only relaxed in 1959 when Brunei has its own constitution where all internal affairs except the external (foreign)

affairs and defence were under the British Government. In other words, the British government was responsible in developing the agricultural policies over the entire period of pre-independence particularly before 1959 (Franz, 1990). The next section will examine development of rice agriculture in the post-independence period.

3.5.2. Post Independence (1984 onwards)

Immediately after Brunei gained its independence in 1984, the policy on food and agriculture took on an even greater significance. It was seen as necessary for public order and security, whilst being designed to improve public welfare. The government set the objective of attaining an ambitious 30% self-sufficient status in rice production in the fourth and fifth development plans. In the 5th NDP the “Paddy Assistance Scheme” was introduced that included infrastructural development (farm roads); thresher incentive schemes; continuing advice; farm management and post-harvesting; utilization of production technology; utilization of high-yielding varieties of rice per hectare; and pest management control and diseases. However, despite the introduction of the Paddy Assistance Scheme, rice farming continued to decline towards the end of the 1980s to 1990s. The main reasons were the presence of cheap imported rice and the attraction of living in urban areas, which caused the decline in the number of rice farmers (Upex & Ulluwishewa; 2002).

In view of the importance of food and agriculture to the nation’s economic and political stability, the government modified the policy on self-sufficiency as subsumed under its economic diversification drive to a more realistic approach towards supplying food and agricultural products. This change is reflected in the Sixth NDP (1991-1995), where the agricultural policy becomes aligned with national food security policy (NDP 6 1991-1995, pp.37). By the mid-1990s, the overall economy was weak, and high unemployment rates influenced those aged above 45 years to go back to rice fields. The 7th National Development Plan Committee (1996 to 2000) reported that the country remained substantially dependent on imported rice despite the government’s various programmes and incentives to farmers. In fact, local production only accounted for as low as about three per cent of the total requirements at that time. The reasons included a reliance on part-time rice farmers, the *Wasan* scheme not being fully commercialised, and a local rice subsidy that did not encourage farmers to undertake large-scale rice planting. Hence, a revised modest target of

seven percent of the total local requirement was set by 2000.

In the 8th National Development Plan (2001-2005), it was reported that the number of rice farmers had declined from 690 to 121 in the year 2000. During this time, the country was producing one percent of its local requirement. By 2007, Brunei was producing 3.12 percent of local requirements (DEPD, 2008). Despite these efforts, Brunei's goal towards self-sufficiency in rice production, as part of its economic diversification strategy which will be discussed in the next section, remained unmet. There continues to be a declining trend in the number of rice farmers and areas under rice cultivation, even as rice agricultural activities are still practised on a subsistence basis (Upex & Ulluwishewa, 2002).

To surmise, the purpose for an emphasis placed on wet rice cultivation seems to be reflective of the events that ensued during that time. Records from earlier 20th century show that dry rice was once extensively grown and was overtaken by wet rice agriculture. The shift in growing more wet rice was due to the government's initiatives to encourage its cultivation, such as lower land rental charges, land ownership and providing irrigation and drainage. After the 2007/2008 global food crisis, more people began to recognise the importance of wet rice as a staple food. Positive changes were visible through an increase in domestic rice production and the number of rice farmers working on the areas initially abandoned. In the 9th and 10th National Development plans self-sufficiency in rice production continues to be pursued. However, the outcomes of the government's programmes in diversification and in food security have not been encouraging. Hence, this current study is an attempt to understand the factors that come into play in the lack of achievement of these goals.

3.6. Nature of Rice Farming

Traditionally, there are two types of rice grown in Brunei: (i) dry/hill/upland rice (also known as '*padi tugal*' or '*padi bukit*') and (ii) wet/swamp rice (better known as '*padi paya*' or '*padi sawah*'). There are several differences between dry and wet rice as shown in Table 3.1

DRY RICE	WET RICE
Shifting (swidden) cultivation system.	Sedentary system
Regular land rotation.	Transplanted from a nursery to the field.
Less labour & skill.	More labour, skill and care for most of the farm operations.
Far away from settlements.	Usually found very close to settlements where farmers live.
Found on slopes, undulating land & lowland areas.	Field had to be impounded with water. Thus, found only on lowlands.
Less confined. Discouraged by government (perceived as a destructive system) – higher rent (initially \$0.50 per acre in 1937 and then increased to \$1.00 per acre in 1939)	More confined. Encouraged by government who provided TOL at a lower rent (\$0.40 per acre in 1937). Additional info: Gazetted land – currently no rent being charged by the government.

Table 3.1: Differences between Dry and Wet Rice

Source: Upex & Ulluwishewa, 2002

Dry rice is grown under a system of shifting cultivation that involves slash and burn, usually on steep hillsides. The forest is felled and burned, and a crop planted on the steep hillside for one, two or three years depending on the fertility of the soil (BAR, 1926; BAR, 1956). In contrast, wet rice is a sedentary type of agricultural system (Upex & Ulluwishewa, 2002). A further distinctive feature is the way rice is planted. Dry rice, as the name implies, is grown on the dry ground very much the same as other cereals, whilst wet rice is grown in standing water (Yah, 2009). Dry rice was once widely grown in Brunei and other parts of Southeast Asia. This type of rice is highly disfavoured by many governments, including Brunei, due to a variety of reasons. Firstly, the productivity of dry rice per hectare is much lower than that of wet rice, despite more labour and manure input. Secondly, dry rice consumes much more nutrients from the soil than wet rice, and often the land has to be fallowed for one or two seasons after one or two seasons of cropping. Thirdly, the “Green Revolution” in Southeast Asia has significantly increased the yield of wet rice cultivation, thus rendering the

differences in productivity between wet and dry rice even greater (Yah, 2009; Upex & Ulluwishewa, 2002). Also, dry rice involves moving from one place to another which leads to land degradation. For these reasons, wet rice cultivation is preferred.

3.7. Current Rice Production Policy

Attaining self-sufficiency in rice production has been a continuous goal and an uphill battle for Brunei as part of its diversification strategy. Rice agriculture in Brunei is a dwindling activity. According to Horton (1998, p.86), 'rice is the staple food of the inhabitants of Brunei, but the country has never been able to produce sufficient to meet its needs at any rate in the modern era'.

Indeed, witnessing the marked negative effects of the global food crisis on countries highly dependent on food imports, including Brunei, prompted His Majesty to express his concern during his birthday celebration in 2008. This led to the Ministry of Primary Resources and Tourism (MPRT) through the DAA to revitalize the fledging sector as part of its economic diversification plan by putting in place an ambitious development plan of self-sufficiency in rice production. This time round, the rice production programme was aimed at increasing the country's rice production from 3.12 per cent (982.9 metric tonnes) in 2007 to 20% self-sufficiency (5,800 metric tonnes annually in 2010). These targets would be achieved in the short-term plan while 60% self-sufficiency (18,000 metric tonnes annually) would be attained by 2015² through a medium-term plan (DAA, 2009a; Hajah Aidah, 2011). The programme was the result of a number of key factors affecting the country's economy. First of all, rice continued and still continues to be the staple food in the Bruneian diet. Currently, the typical Bruneian consumes around 82.6 kg of rice a year, compared to Singaporeans with a lower figure at around 72kg. This strand of analysis shows that Brunei spends relatively more on rice imports, thus creating a potential balance problem of payment for the country.

To guard against the difficulty of a balance of payments deficit, the short-term plan or Plan A was implemented from the end of 2008 to 2010. Under this plan, the country set a target of 20% self-sufficiency or 5,800 metric tonnes, entailing an increase in the area under rice

² Previous target for local rice production was as follows: 7% for the year 2000; 3% or 1,300mt worth B\$1.18million by 2005; 3.12% in 2008; and 2.9% in 2009.

cultivation from 2,783 ha in 2009 to 5,380 ha in 2015. To achieve these goals, among the approaches adopted by the DAA are namely: (i) the opening of new rice farming areas covering 4,904 ha at *Buau*, *Kandol*, *Labi Baru*, *Lot Sengkuang* in Belait District and *Limau Manis* in Brunei-Muara District; (ii) upgrading existing field infrastructure, such as main roads, effective irrigation and drainage, and flattening areas; (iii) switching from traditional varieties to high-yielding varieties (HYV) capable to be planted twice or thrice in a year such as *Laila* rice that only requires 3-4 months for each cropping compared to the 6-7 months for the traditional varieties; (iv) providing relevant courses to the DAA staff and participating farmers; and (v) establishment of the Rice Research Center and simultaneous upgrading of farm technology and post-harvest (DAA, 2009a; Hajah Aidah, 2011).

Aside from short and medium-term plans, the department also designed alternative action plans, labelled as Plan B and C. Plan B covered the opening of new areas such as *Buau*, *Kandol*, *Labi Baru*, *Lot Sengkuang* in Belait District, *Limau Manis* in the Brunei-Muara District and the planting of high-yielding varieties in these areas during the main season. Plan C entailed planting rice during the off-season from April-July 2009 at existing areas in all four districts (DAA, 2009a; DAA, 2009b). Table 3.2 shows the hectares for rice cultivation under each district in the short and medium terms.

Additionally, the DAA introduced courses to farmers under its '*Sekolah Perladangan Pengusaha Padi*' or Rice Farmers Field School (RFFS). These courses are one of the extension strategies used in disseminating agricultural technology to the farmers, which involve experiential learning and participatory approach methods. The department also published a manual in 2007 based on the Palaycheck System for Irrigated Lowland Padi entitled '*Sistem Semakan Padi Bagi Padi Paya*' which is used as a reference by rice farmers/entrepreneurs in implementing systematic farming practices in order to achieve their production targets.

District Location	SHORT-TERM Area (hectares)	MEDIUM- TERM Area (hectares)
BRUNEI-MUARA	230	
Wasan		230
Bebuloh		200
Limau Manis*		1,000
BELAIT		
Lot Sengkuang		1,000
Labi Baru*		260
Buau*		1,000
Kandol*		600
TUTONG		
Supon Kecil*		955
TEMBURONG		2,360
Lekium/Perdayan		700
Selapon		150
Senukoh		80
TOTAL		6,175

Source: DAA (2009a)

Note: * Areas identified for the short and medium-term plans

Table 3.2: Areas identified for the Short and Medium-Term Plans

3.8. Progress in Rice Agriculture

Despite the emphasis on cultivating rice in Brunei as outlined in Sections 3.3 and 3.4, the progress in rice agriculture has been glaringly meagre for the past 50 years. This is evident from Table 3.3 that shows both rice acreage and production drastically dropping in all districts. In terms of acreage during the period 1964 and 2014, Tutong recorded the highest decline, decreasing by 82%, followed by Belait District with a reduction of 52.7% (United Nations Food and Agriculture Organisation, 1965; DAA, 2015).

Similarly, rice production has significantly dropped for both Tutong and Belait Districts by 81.5% and 69.6% respectively. A number of factors can explain the overall reduction. Firstly, urbanisation has attracted young population to work in urban areas leading to a smaller

number of farmers. Secondly, land previously allocated for rice production was converted mostly for residential development. Thirdly, rice farmers tend to plant the traditional variety of rice that produces low yields, hence lower productivity. Additionally, these farmers preferred to use traditional methods of rice planting and cultivation (Datin Hajah Gayah & Kamariah, 1995).

District	Area (ha)					Production (mt)				
	1964		2014		Change	1964		2014		Change
	% of Total	% of Total	% of Total	% of Total						
Brunei Muara	1,069.2	32.6%	602.3	18.4%	-43.7%	1,121.1	34.2%	939.4	28.6%	-16.2%
Belait	567.4	17.3%	228.7	7.0%	-59.7%	389.5	11.9%	118.5	3.6%	-69.6%
Tutong	1,167.6	35.6%	210.7	6.4%	-82.0%	651.7	19.9%	120.4	3.7%	-81.5%
Temburong	475.6	14.5%	242.1	7.4%	-49.1%	334.6	10.2%	203.4	6.2%	-39.2%
TOTAL	3,279.8	100.0%	1283.9	100.0%	-60.9%	2,497.0	100.0%	1381.7	100.0%	-44.7%

*Note: This is the only agricultural census undertaken in Brunei.

Table 3.3: Distribution of rice production and acreage by districts, 1964-2014

Source: * State of Brunei (1966) & DAA (2015)

Table 3.4 shows the number of farmers for the period from 1995 to 2015. There is a fluctuating trend in the number of farmers with significantly fewer numbers recorded for the period 1995 to 2005. These readings are attributed to the lack of interest in rice cultivation especially among the younger generation. However, in 2006 to 2012, a spike can be seen in the number of rice farmers due to revitalization strategies in rice farming.

Year	No.of farmers	Area (ha)	Production (mt)	Rice 65% milling recovery (mt)
1995	712	880.0	328.0	213.2
1996	690	613.4	287.0	186.6
1997	584	560.0	289.0	187.9
1998	527	503.3	135.0	87.8
1999	419	381.3	199.0	129.4
2000	529	463.5	299.0	194.4
2001	508	481.5	350.0	227.5
2002	565	507.9	372.0	241.8
2003	746	689.3	546.7	355.3
2004	797	756.8	620.2	403.1
2005	980	975.0	851.3	553.4
2006	1034	1094.7	895.3	582.0
2007	1233	1354.6	982.9	638.9
2008	1199	1300.1	911.3	592.3
2009	1225	1187.1	891.4	579.4
2010	1197	1848.0	1071.7	696.6
2011	1227	1604.2	1480.0	962.0
2012	1238	1797.3	1756.0	1141.4
2013	991	1288.5	1237.0	804.1
2014	891	1090.6	1382.0	898.3
2015	835	1302.9	1983.2	1289.1

Table 3.4: Trends in Rice Production (1995-2015)

Source: DAA (2015)

Figure 3.4 demonstrates the trends in rice production regarding local and imported rice vis-a-vis self-sufficiency levels. Overall, there is a high dependence on rice imports while domestic production remains small. The level of self-sufficiency was at its lowest level in 1998 at 0.4% due to the El-Nino, and remained at low levels between the ranges of 0.6% in 1999 to 5.9% in 2015. It is, therefore, evident that the government's initiatives to spur the growth of rice agriculture failed to translate into desired objectives.

Figure 3.4 Trends in Rice Production, 1970 – 2015
Source: DAA

3.9. Distribution of Rice Fields

According to a report published by the Commonwealth and Scientific Research Organisation (CSIRO) in 2010, the Ministry of Industry, Primary Resources and Tourism (MIPRT) allocated one percent of Brunei's total land size (about 5,800 hectares) for rice production.

With only 1% of land being reserved for rice agriculture, Brunei's distribution of rice fields was closely linked to its physical features of relief and water courses found scattered in the country. This is especially true of the Tutong Valley, where areas of rice production were situated in proximity to the Tutong River and the Kampongs situated along the banks. The report also stated that having access to water supply was essential, as most rice fields grown either on government or private land had limited to no irrigation and, so, was dependent on a rain-fed source of water supply. Most active rice fields were located in the *Wasan* area in the Brunei-Muara District, in valleys in the Tutong and Belait Districts, and the coastal lands of Temburong (CSIRO Report, 2010) on small plots of land.

In the past, rice fields tended to be located in swamplands found in most parts of the country with one crop planted per year. Despite the 1% allocation of land for rice agriculture, swamplands were still underutilised as only parts of the agricultural land were actually used for planting each year. The main areas for planting include Mukim Labi in the Belait district; Mukim Rambai, Tanjung Maya, Kiudang and Lamunin in the Tutong district; and Mukim Labu in Temburong district. The total area of the smallholder rice land was estimated to be 500ha (Huszar Brammah & Associates, 1987). Smallholder rice production was associated with upland cultivation in hilly areas of Brunei and was the main product of a shifting cultivation practised predominantly in remote parts (Ibid).

To date, there has been an increase in the distribution of rice fields as a direct result of the change in agricultural policy, in response to the 2007-2008 global food crisis that led to reopening abandoned plots and new rice fields, as reflected in Figure 3.5.

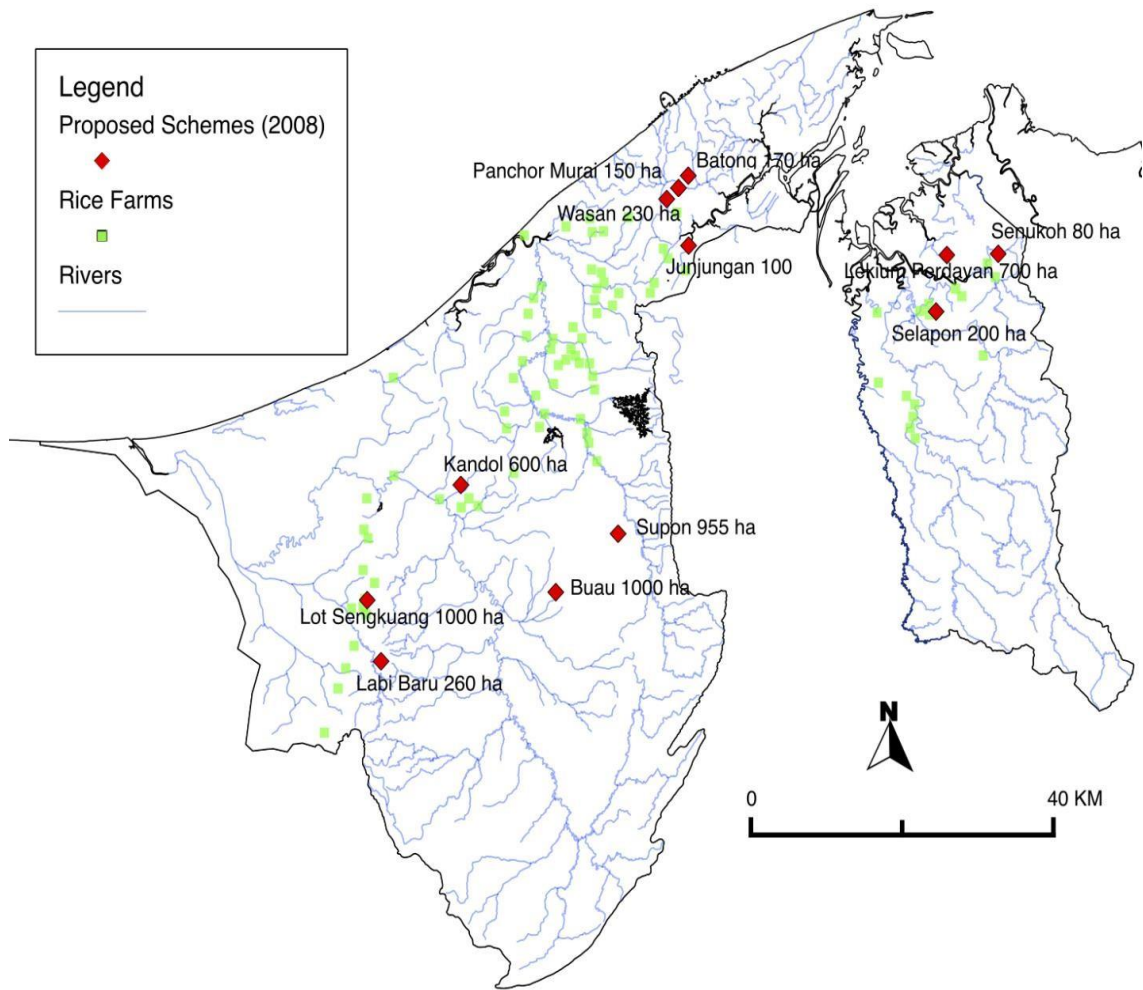


Figure 3.5: Map of Rice Fields

3.10. Chapter Summary

Overall, the development of rice agriculture has failed to meet the objectives of the NDPs. Despite incentives introduced, such as infrastructural development (farm roads); thresher incentive schemes; farm management and post-harvesting; and end-product subsidy to spur growth, these forms of encouragement have not translated into higher rice production nor a consistent, growing and a significant increase in the number of farmers and acreage. Evidently, Brunei still continues to rely on rice imports to cover the shortfall in domestic production. Hence, economic diversification is arguably a long way from being achieved.

Yet, rice agriculture continues to be included as a significant national policy as it is viewed with the promise of economic and political stability that ultimately secures national food security which is reflective of arguments of a rentier state where a government acts in contradiction to what was proposed. Based on the above explanation

of the state, Brunei does not fit cleanly into established categories of states examined in the context of development. On the one hand, it is an Asian country surrounded by neighbours who have transformed themselves from raw material export economies into globally competitive manufacturing powerhouses. On the other hand, it bears a remarkable resemblance to the GCC Arab states in many respects. Hence, Brunei is an inherently interesting place that warrants close study of its efforts at economic diversification, not least because both the country and this area of scrutiny has thus far been under-researched.

The next chapter will outline the methodology that was used for this study on the *Wasan* Scheme. The *Wasan* Scheme was set up in response to economic diversification and food security calls by the government in 2009. It is important as it signals renewed efforts to diversify the economy through agricultural activities. *Wasan* Scheme, a wet-rice agriculture project with government support. The next chapter looks at collection of interviews, survey questionnaires and document analysis to assess the scheme level of success in contributing to the government goals of achieving economic diversification and food security.

CHAPTER 4

Methodology

4.1. Introduction

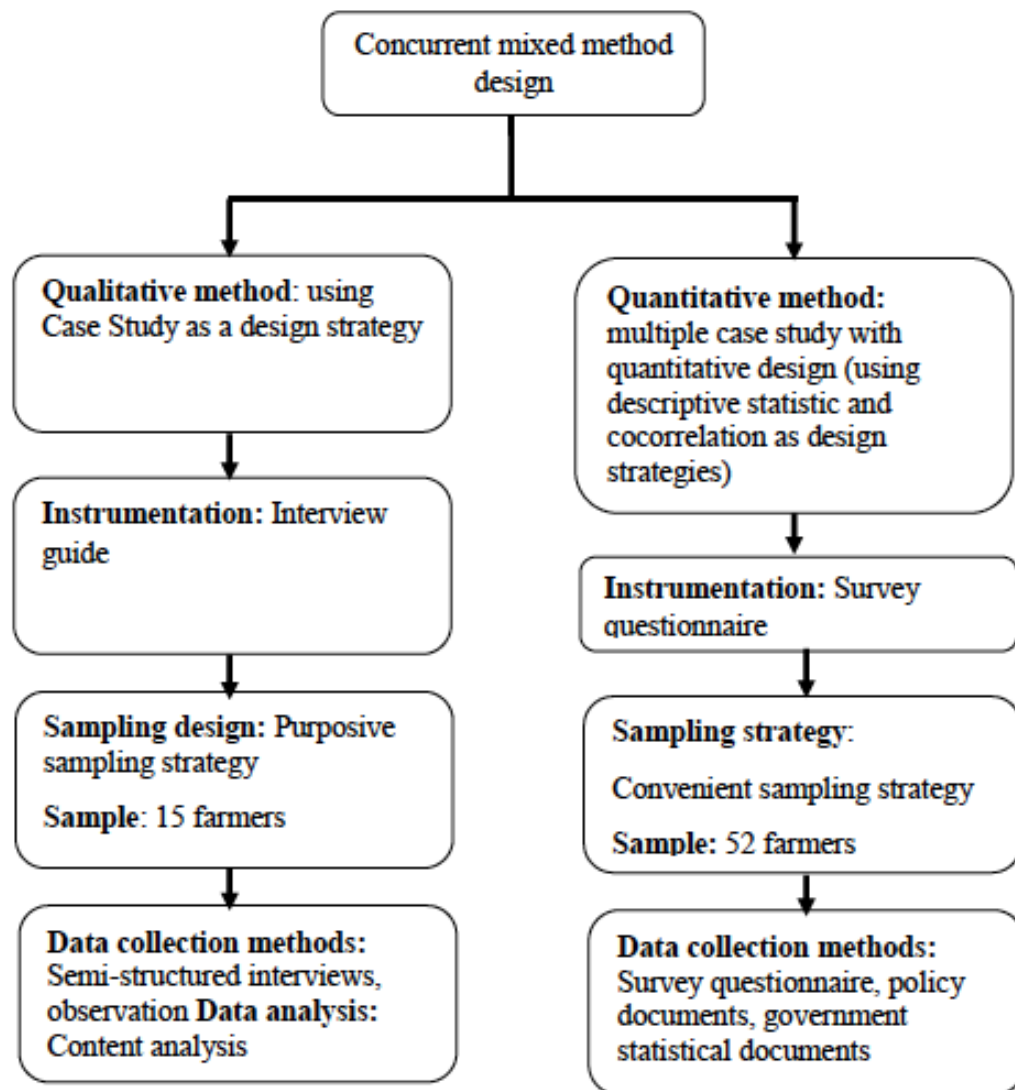
This study employed a mixed-method research design (qualitative and quantitative) to generate and analyse data that helped to ascertain *Wasan* wet-rice project's goals, implementation issues, challenges, and achievements, and draw policy recommendations in the context of Brunei's economic diversification efforts through agriculture. This chapter, therefore, covers the data collection and analysis methodologies adopted for the study as well as fieldwork experiences.

As part of Brunei's economic diversification efforts, the *Wasan* scheme was introduced to diversify away from its heavy reliance on the oil and gas sector. In answering research question 1 on the primary goals of this scheme, the researcher have resorted to policy documents and semi-structured interviews with officials as information obtained from review of policy documents alone will not be enough as officers in charge of any project are changing all the time and new staff do not have complete answers. In analysing research questions 2 and 3 on the success of the scheme and the factors that contribute to its success and/or failure respectively are examine using a mix of qualitative and quantitative approaches to ascertain different perspectives of its perceived and actual success. This method is effective in answering questions 2 and 3 as a single method cannot provide adequate information to understand the case of *Wasan* Scheme. The discussion of research questions 4 and 5 would examine the significance of the findings for questions 1-3 for theory and policy which will be discussed in Chapters 5 and 6. The discussion of question 4 would directly engage with and inform the theoretical discussion in chapter 2 in particular on the rentier state, Dutch disease and resource curse thesis. Thus, the chapter is divided into ten sections. Section 4.1 describes an introduction to this chapter. Section 4.2 outlines the mixed method approach and explains the reasons for adopting it in the current study. This is followed by Section 4.3 which is on Case Study Approach and the justifications for using the approach in the current study. Case Study approach is use to answer all the research questions. The development of data collection instruments: *Piloting, Validity and Reliability* is presented in Section 4.4 followed by Section 4.5 which

is on Sampling Design which includes a brief explanation of the population and sampling strategies used in the study. This is followed by a discussion on data collection procedures (Section 4.6); data collection strategies (Section 4.7); data analysis (Section 4.8), and ethical issues (Section 4.9) all linking up to the examination of the limitations and strengths of the *Wasan* Scheme. This chapter ends with a reflection of the study (Section 4.10).

4.2.Mixed-Method Approach

The mixed-method paradigm amalgamates, in a single study, both qualitative and quantitative methods including their associated data collection and analytic strategies in addressing research problems (Tashakkori & Teddlie; 2003, 2010). How the mixed-methods has been adopted as a research design for this study is presented in Figure 4.1.

Figure 4.1: Concurrent mixed method design

Based on the research design in Figure 4.1, the data types – qualitative and quantitative – were collected during the same stage where the priority or level of emphasis was equally placed on both the qualitative and quantitative data (Creswell et al., 2003a, 2003b).

Similarly, mixed strategies for the data collection was used. Qualitative interviews and observation were employed to gather data for the qualitative phase of the study while combining the traditional survey questionnaire for the quantitative data. The idea of mixing data collection strategies in this manner is to seek actual data integration, connecting both qualitative and quantitative data together. For instance, after the data

collection, the two data sets are merged into one large database. The results of the data are then used side by side to support each other, such as qualitative quotes to support statistical results (Creswell & Plano Clark, 2007).

4.3. Case Study Approach and the justifications for using the approach

The researcher's intention to understand the *Wasan* Wet-Rice farming Scheme's contribution to Brunei's economic diversification efforts was the main reason for adopting the Case Study approach for this study. Thus, the *Wasan* Scheme, a bounded system of wet rice agriculture, was the 'unit of analysis' (Merriam, 1988) or 'object' (Stake, 1994, 1995) of the study. The case-study approach optimises understanding of the case as the aim was not to generalise the findings to other cases. The study involved a detailed examination of a single representative subject (*Wasan* Scheme) in the natural setting by means of various qualitative and quantitative data-gathering techniques to gain a deeper understanding of the case. Thus this case study uses a mixed method approach. According to Burns (1994), this approach is most appropriate to be used as a method of inquiry in situations where people's behaviour in an organisation is to be studied and where the focus is on a contemporary phenomenon within a 'real life context.'

As a qualitative research design, case study approach is very adept at offering richness and depth of information, which is often not provided by other quantitative methods. It has proven to be a highly versatile research design and has the capacity of paving the way for identification of a complex set of circumstances that can come together to produce a highly valuable body of information on the study of wet rice agriculture in *Wasan*. The following arguments have been put forward to explain why the present study utilises a case-study approach.

Firstly, the researcher wish to understand the 'case' (*Wasan* Scheme) in depth rather than the desire to know whether such an understanding was applicable universally. In other words, the study is aimed at obtaining context-bound information rather than a generalisation of information.

Secondly, the event or the 'case' to be examined include the problems faced by farmers at *Wasan* Scheme where their problems are anchored in its natural or real-life context (physical, political, economic and social) which cannot be controlled for the purpose of

research. Farmers' problem involves 'multiple realities' depending on the different contexts. In such a study, quantification alone may not provide an adequate understanding of the phenomenon being studied.

Thirdly, since the purpose of this study was more of an attempt to understand the contribution of the *Wasan* Scheme to economic diversification in its natural setting from the perspectives of the farmers, the methodology used need not concern itself with 'representativeness' or 'randomness' or large sampling. A case-study method was judged to be most appropriate as generalisation was not the aim of the study.

Fourthly, in the context of Bruneian culture, the case study approach was considered to be the most appropriate research methodology to adopt. The quantitative method alone would not have been able to capture the nuances, the rich verbal data, and the body language of people during data collection, which conveyed special meaning to what they did and/or did not say.

Fifthly, in the last two decades, the case-study approach has been widely used in social science research supported by e.g. Hancock (2002), Patton (1980) and Sadler (1985).

Finally, the reason for the study was mainly to search for data to provide enlightenment in the development and management of the *Wasan* Scheme (descriptive purpose) rather than support or disprove a pre-conceived idea or hypothesis. Thus the nature of the findings of the research study was intended to be descriptive and to some extent, interpretive rather than hypothesis testing.

While the qualitative paradigm and its allied case study design are generally credited for their capacity to examine and extract 'thick' data and in-depth accounts of rice farmers' experiences within their natural context, it is also believed to be incapable of:

- a) accurately operationalizing and measuring some specific construct in the study,
- b) conducting group comparisons using t-tests that are necessary for some analysis,
- c) examining the strength of association between variables of interest using correlation, r^2 and regression analysis, and

- d) specifying and testing research hypothesis (Guba & Lincoln, 1994; Castro et al, 2010).

4.4. Development of Data Collection Instruments: *Piloting, Validity, and Reliability*

The main aim of the study is to investigate rice farmers' experiences in wet rice agriculture as part of the diversification strategies in Brunei. In line with the mixed-method approach, two main instruments, interview-guide and questionnaire, were used to capture both quantitative and qualitative data, although secondary data sources were also utilized.

To minimize the likelihood and the severity of data validity problems in designing the questionnaires (Johnson & Turner, 2003), the researcher has adopted the following approaches to ensure that the required data matched the objectives of the study. Firstly, the researcher made sure that all items in the questionnaire and interview-guide are in line with the study objectives, and be able to garner the needed data. Secondly, natural and familiar language was used to ensure respondents and interviewees understand the questions. *Mukim* and *Koseka* for instance, are familiar names among the rice farmers at *Wasan* Scheme. Such terminologies are retained in the questionnaire to ease and enhance understanding of the questions.

Thirdly, ambiguous terminologies, abbreviation, and difficult words were avoided. Fourthly, all questions and statements were kept short, clear and precise. Fifthly, items and item numbers were made simple, the questions were made to flow easily from one to another and were grouped into topics in a logical sequence. Similarly, the researcher ensures that leading and loaded questions were avoided. At the same time, the type and nature of data needed were determined. All attempts were made to make sure that mutually exclusive and various types of responses were included in the questionnaires and interview-guide.

Finally, the instruments were pilot-tested for "understandability". It is aimed to ensure that each item in the questionnaire is easier to understand for both the respondents and interviewees; the jargons and technical terms used in the interviewee-guide and questionnaire were appropriate to the respondents and interviewees; the statements and questions in the interviewee-guide questionnaire were clear and unambiguous to avoid

misinterpretation and misunderstanding of the study objectives; the items elicit a single response; and they were not too much of a burden for the respondents and interviewees. Ultimately, the instruments and the interview process were evaluated, and amendments were subsequently made to enhance the quality of the instruments and to address possible biases.

4.4.1. Interview-guide

The interview-guide, which was a qualitative instrument for data gathering, was used to capture qualitative data. It simplifies the extraction of in-depth information regarding the experiences and viewpoints of the rice farmers. The interview-guide is made up of five main broad topics/sections:

- a) Demographic information of rice farmers, e.g. gender, age, educational level.
- b) Characteristics of rice farming, e.g. farm size.
- c) Perspectives of farmers on the viability of the *Wasan* Scheme.
- d) Indirect contribution of rice farming to the economy of Brunei.
- e) Challenges/problems encountered by rice farmers

The interview-guide was constructed based on the research questions and an extensive literature review on economic diversification and wet rice agriculture in Brunei. Semi-structured interviews (Appendix A) and observations were used to capture data for all the items in the interview-guide.

4.4.2. Questionnaire

Questionnaire instrument was mainly used to obtain the quantitative data (Appendix B). The instrument consists of six sections, each section eliciting information on farmers and farm details. Section one of the questionnaire aims at obtaining demographic data of the rice farmers. The demographic data were required to support the analysis of the salient characteristics of the rice farmers at the *Wasan* Scheme. Section two deals with the structure of farm, household and cost involved in rice farming followed by section three which seeks information on sources of agricultural inputs such as fertilisers, pesticides, cost of renting machinery and types of rice variety the farmers used. The fourth and fifth sections of the questionnaire dealt with rice farming outputs and commercialization of farm yields, while the last section of the questionnaire gathered data on challenges and problems encountered by farmers in their farming activities.

4.4.3. Piloting the Research Instruments

The research instruments were piloted to find out their applicability in the field. The pilot testing was conducted in Malay which is the national language of the country. It was carried out during the months of March and April 2010 at *Wasan* rice fields following the approval by the DAA and Leader/Head of each group of rice farmers.

The pilot study disclosed vital issues about the methodology. First, it indicated that the methodology, which was initially influenced by only quantitative paradigm, needed to be revised. This paved the way for the inclusion of the qualitative component of the study. Second, the result of the pilot study revealed that the probability sampling strategy, which was initially adopted, was difficult to implement practically. The researcher quickly found that it was increasingly difficult to obtain a sample frame. This was exacerbated by the fact that the rice farmers were unpredictable regarding their availability at the rice fields. This revelation informed the adoption of the non-probability sampling strategy. Third, the pilot study also showed that it was difficult to obtain certain information from rice farmers with only the quantitative data collection instruments. Fourth, through the piloting of the instruments, ambiguities, inappropriate and unclear questions were identified from the responses and interview scripts. The findings of the pilot study resulted in re-wording and complete elimination of certain questions and items in the research instruments.

Finally, the finding of the pilot study also culminated in re-wording most of the investigative questions which take cognizance of the respondents and interviewees' cultural sensitivity, thereby, fulfilling the requirement of the ethical validity of the study. It also made it possible to test the research process and fieldwork. From the fieldwork, the researcher is equipped with distinct knowledge of the Bruneian society, which assuredly would not have been obtained without piloting the instruments. The researcher has come to know that, in Brunei, respondents and interviewees relate to researcher at two distinct levels: (i) personal and (ii) official levels. With the former, respondents and interviewees divulge a wealth of information (data) with minimal difficulties to the researcher. For the latter, however, the researcher finds it increasingly cumbersome to extract data from the interviewees and respondents. At this level, interviewees and respondents are seemingly afraid of the outcome of the divulged information, and therefore, appear inward-looking and suspicious of the researcher, who was considered

an outsider. These experiences from the fieldwork further result in revising the entire methodological approach to suit the context of the study.

4.4.4. *Validity and Reliability of Instruments*

In this study, test-retest reliability method was adopted for the quantitative data, while qualitative reliability procedures were used for the qualitative data as it was the most appropriate. The validity of the research instrument, pilot-testing and experts' scrutiny of the instruments were employed to enhance the validity of both qualitative and quantitative instruments. The validity and reliability of the instruments are discussed next.

Validity of Quantitative Instrument

To evaluate each of the items in the questionnaire the researcher used content, face and construct validity as well as experts' knowledge (Cohen et al, 2000; Black, 1999 & Punch, 2005). The experts or validation panel was made of five experts in rice farming and economic diversification. They include one from the DAA, two leader of *Mukim* and *Koseka*, one rice farmer and one postgraduate student. The five experts' opinions were considered adequate for any effective validation (Cohen et al., 2000). Their role is to examine whether or not the questions in the survey questionnaire are "...obviously more pertinent to the meaning of the focal concept than it is to the meaning of other concept" (Brewer and Hunter, 1989 p.131) (face validity); the questions in the survey instrument comprehensively cover the items that it purports to cover (content validity); and the collected data can be used to generalize for the entire rice farmers' population in the *Wasan* (external generalisation) (see later a discussion on this subject in Section 4.5 on Sampling Design).

Having assessed the survey questionnaire, the validation panel recommends that the structure and formatting of the survey questionnaire to be restructured; some questions were deleted from the questionnaire, while other questions were recommended to be included; and some few items were reworded. These amendments were made to achieve face and content validity.

Reliability of Quantitative Instrument

Reliability of the quantitative instrument was assessed using test-retest method. To do this, survey questionnaire were administered to thirty (30) rice farmers to respond to the questions in the instrument at two different times. The responses were quantified with a

correlation coefficient (r value). Per the rule of the test-retest, the r value must be ≥ 0.70 . The test result, after quantifying the responses with a correlation coefficient (r value) of 0.82, which is considered good and reliable (Black, 1999).

While this method of reliability test is used, it is time-consuming. The researcher was required to administer the survey questionnaires twice in order to fulfil the requirement of the test. This is unavoidable in certain situation where other reliability test strategies are deemed inappropriate (Black, 1999; Cohen et al., 2000). All efforts were made to ensure that the majority of the respondents who responded to the questionnaire during the pilot testing were not included during the actual data collection. This was to ensure that respondents were not sensitized to the extent of rendering the instrument unreliable (Joppe as cited in Golafshani, 2003).

Validity and Reliability of Qualitative Instruments

In this research, Guba & Lincoln's (2005) concepts of credibility, dependability, and confirmability were used to address issues of validity and reliability for the qualitative instruments. To maintain credibility the researcher used the following strategies. First, the researcher ensured that suitable qualitative instrument gathered the intended data. To do this, the researcher adopted the right qualitative data collection strategies, namely, semi-structured interviews, observation and archival methods to collect the appropriate data. Further, qualitative data analytic methods were employed in the analysis of the collected data. The use of qualitative data collection and analytic strategies are to ensure that data from multiple sources speak to the same investigative research question or objective. Second, the researcher is a native Bruneian, who is familiar with the culture of Bruneians and participant in particular. This eases problems of cultural conflicts and facilitates field entry and access to data. Third, the researcher has had a prolonged engagement with the rice farmers. This enables the researcher to establish a cordial relationship and build trust with the rice farmers. Fourth, the use of multiple data collection methods guarantees triangulation. With this, the researcher can compare data collected using different methods and from multiple sources.

Fifth, member checking and debriefing have been useful. Informants are given the opportunity to read what is written about them. This gives them a chance to delete the data they do or not want to include in the interview scripts. Sixth, thick description of wet

rice cultivation activities and the challenges encountered in the process are presented using direct quotation of the informants. The detailed description helps to convey the true information of the informants. As a result, this helps enhance the credibility of the data and presents the actual information or situation of the informants.

On the other hand, to ensure that the data is dependable, every effort is made to report in detail all the processes of instrumentation, data collection procedures and the processes involved in the data analysis. For instance, the research design and its implementation were clearly outlined, the operational detail of data collection was clearly presented and the reflective appraisal of the study was also made. All these measures were taken to ensure that research practices were followed and to enable future researchers to replicate the study in the same or similar contexts to evaluate if they can obtain the same result or findings.

While to ensure confirmability, the researcher used triangulation in the data collection strategies. As data from different sources are used it has the tendency of reducing an investigator effect. Similarly, the confirmability is also checked through member checking and the thorough description of the researcher's role and the process of data collection (Shenton, 2004; Lincoln & Guba, 1985).

4.5.Sampling Design

The sample design involves the population of the rice farmers at *Wasan* Scheme and the decisions that were made in the selection of the rice farmers who took part in the study.

4.5.1.Population

The population of the rice farmers in the *Wasan* Scheme is categorised into two: *Koseka* rice farmers (retired service personnel) and *Mukim* rice farmers (villagers). The *Mukim* rice farmers consist of seven villages within the *Mukim Pengkalan Batu*; (i) Kg. Junjungan; (ii) Kg. Limau Manis; (iii) Kg. Pengkalan Batu; (iv) Kg. Masin; (v) Kg. Wasan; (vi) Kg. Panchur Murai; and (vii) Kg. Batong (Figure 4.2). According to the regulations of the Department of Agriculture and Agrifood (DAA), the *Mukim* rice farmers are permitted to use only less than one hectare of land for rice cultivation purposes. Although this regulation is in practice, many *Mukim* rice farmers use names of their family members to get the right to use more than one hectare. The *Koseka* rice farmers, on the other hand are entitled to more than one hectare of land but not exceeding

five hectares. Any rice farmers having more than five hectares of land is considered to be doing rice cultivation on a commercial basis. For this reason, such a farmer would not be entitled to incentives and subsidies. This serves as monitoring and control measure of the land since arable land for the *Wasan* Scheme is limited.

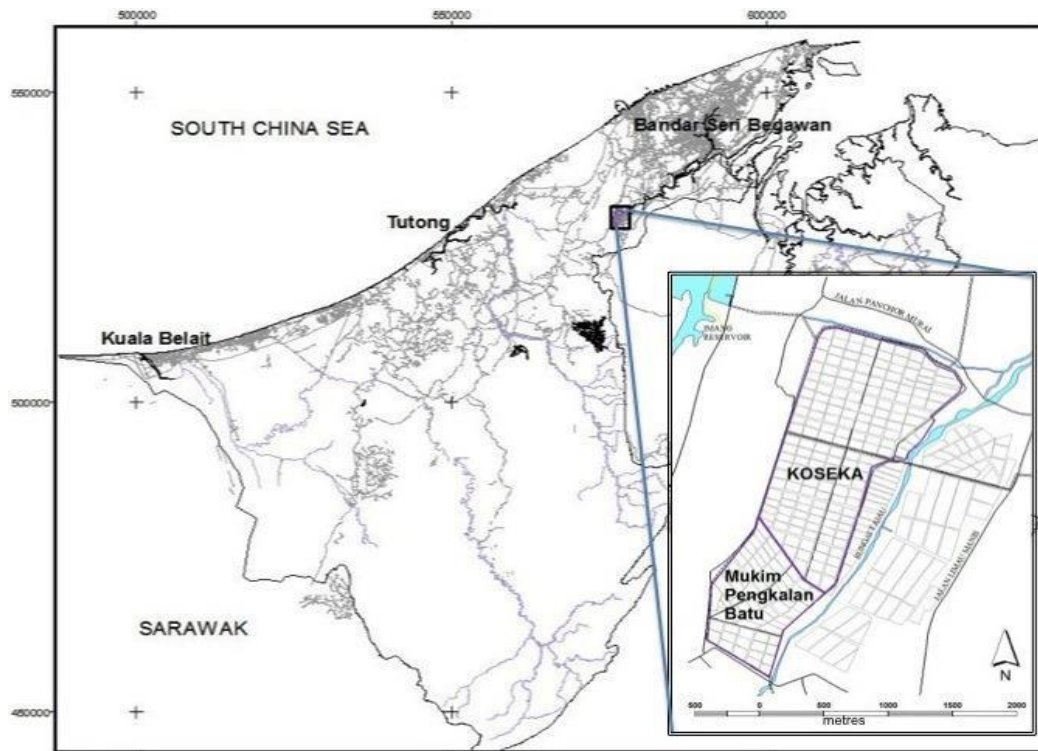


Figure 4.2: The study area, *Wasan* Scheme

Source: Author

During the time of study, the rice farmers do not pay any fee for using the farm land at Wasan Scheme. Also, the DAA supplies seeds, fertilisers, pesticides and machinery to the rice farmers at a subsidised price. It should be noted that only a small number of farmers have their own tools including machines for all works such as ploughing, planting, and harvesting. The majority of them depend on renting the tools for ploughing and planting. As water plays a major role in farming, the use of water is rationed for the two groups of farmers. The Mukim rice farmers have the full right to use the water during odd days, while Koseka use it during even days. For the Mukim rice farmers, the water is opened for them from around 7 am and stops at night. Often, the rice farmers sell their products back to the government; some are milled and give out for sedekah/alms, some as seeds and some are used for family consumption.

4.5.2. Sample Size Determination and Sampling Strategy

To determine the sample size (n) for the study, this study considered the population (N) of the rice farmers in the *Wasan* Scheme. However, the researcher encountered difficulties in obtaining the sample frame from the *Wasan* Scheme and the DAA, which is required for any use of probability sampling methods. Due to inaccessibility to the sample frame, a small budget, limited time and other compelling factors, the researcher chooses to settle with the sample size of fifty-two ($n=52$) for a number of reasons. First, it is the belief that any sample which is more than thirty (30) is appropriate for any statistical analysis (McLendon, 2004; Miller, Acton, Fullerton, & Maltby, 2009). Second, the sample size ($n=52$) represents the number of respondents who returned the questionnaires out of 100 sent out to the respondents (see section 4.8.1.1) which constitutes slightly more than 50% rate of return which is quite high proportion considering that the generalisation is only aimed at the *Wasan* population of farmers.

To select the cases or units for inclusion in the sample ($n=52$), a convenient sampling strategy of the non-probability sampling method is considered appropriate for this kind of inquiry³. In particular, there have not been means by which the researcher can know the definite possibility of selecting rice farmers to be included in the sample. Owing to these difficulties, the probability sampling method is considered inappropriate and irrelevant in the sense that the potential respondents (rice farmers) are often not found in the rice fields, and those who are present are usually reluctant to divulge information. Their reluctance to participate in the study is reflected in the responses provided during the pilot study. Thus, most respondents give a simple answer without further elaboration even when repeatedly encouraged to do so. It is, therefore, difficult to select rice farmers, who are to be included in the sample randomly. Furthermore, as mentioned earlier, those who returned the questionnaire which is about half of the total population of farmers in *Wasan* Scheme is adequate to represent the other half of the population who were not purposely selected for the study.

Despite these problems, the researcher was permitted to spend as much time as needed at

³ It is suitable because the probability of selecting the rice farmers cannot be accurately determined due to the difficulties involved in accessing sample frame and other vital information on the rice farming from heads of *Wasan* Scheme and the DAA.

the *Wasan* rice fields to pave the way to select those respondents that have returned the questionnaire. With this support, the researcher spends many weeks visiting one rice plot to the other and contacting rice farmers in order to win their trust and minds to respond to the questionnaires. These processes were repeated until the sample size was over 50% of the population. To reduce sample bias, the Koseka rice farmers, who have the largest population, were strongly encouraged to participate in the study to allow for the possibility of comparisons and internal generalisation to be made on the population.

One of the major advantages of using convenient sampling strategy is that it is relatively cheap in terms of financial and time resources required to undertake a study of this nature. In using this approach, the adequate sample size is achieved in a relatively fast and inexpensive manner. Also, it enables the researchers to collect useful data and extract the wealth of information that would not have been possible by means of probability sampling techniques, which require more formal access to a sample frame of the rice farmers. Without considering the limitations of convenient sampling, which is discussed in the subsequent paragraph, the researcher might not have been able to get access to any data on rice farmers' perceptions and experience of economic diversification via agriculture in Brunei.

Notwithstanding the advantages discussed previously, the use of convenient sampling in this study may lead to a number of biases. It might lead to issues of under-representation or over-representation of rice farmers in the *Wasan* Scheme. For instance, it has been difficult to get a true representation of the *Mukim* and *Koseka* rice farmers in the study due to lack of a sample frame. The two groups of farmers may have different opinion and experience of rice farming in Brunei due to the different treatment they received from the DAA and the heads of each group of the rice farmers. Given this, one might miss the different experiences and perspectives of the rice farmers

In the case of the qualitative sampling, a purposive sampling strategy is used to select fifteen (15) informants out of those 52 respondents who participated in the study using the following criterion:

- 1) Fifteen informants are selected from two groups of rice farmers (5=Mukim and 10=Koseka),
- 2) The informants have at least one year experience of rice farming,

- 3) The informants are beneficiaries of the *Wasan* Scheme,
- 4) They should have participated in the quantitative phase of the data collections,
and
- 5) Have time and agree to spend at least an hour with the researcher.

All the informants fulfil this condition and strictly followed during the selection of informants. The condition is thoroughly explained to each of the informants before they give consent to participate in the interviews. It is useful to note that 5 (Mukim) and 10 (Koseka) informants were considered adequate sample for obtaining qualitative data through semi-structured interviews because it was noticed that the ‘data saturation point’ was realised by the time the third informant was interviewed for both groups. The fourth and the fifth informants gave similar responses. There was little point for the researcher to increase the number of informants to get more data if the saturation point has been reached to the point that no new information was recorded.

4.6 Data collection procedures

Fieldwork procedure starts with access to participants and rice fields by seeking permission from the DAA and leaders of the rice farmers. In this section, access to research field and participants and ethical issues are discussed.

4.6.1 Access to Participants and rice fields

The data collection processes follow the principles and standards of conducting research in Brunei. First permission to conduct research in the *Wasan* rice fields (Figure 4.3) is sought from the DAA (Appendix C).



Figure 4.3: Wasan Rice Fields

Source: Author

Second, once permission and approval were given, a list of leaders of each of the rice farmers' group in the *Wasan* Scheme was provided for further action. In the list, the relevant authority responsible for *Wasan* Scheme was also contacted for permission. Although permission was granted by the relevant authorities in the *Wasan* rice fields, this does not guarantee access to the rice farmers and information. Different arrangements were made to get access to the rice farmers who are willing to participate in the study.

For the Mukim rice farmers, there was a sense of community spirit after the researcher was introduced by the head of the rice farmers. They were well prepared to divulge information and interact with the researcher. On the part of the retired army personnel

(Koseka), they were not prepared to disclose information. The participants have an unreasonable demand. They thought the researcher was in a position to influence rice farming policy and market to their benefit. As a local Bruneian, the researcher has to follow strictly all cultural norms and complex social hierarchy in order to win the hearts and minds of the rice farmers. For example, if a participant bears more than one title, he or she is not prepared to share information unless all the titles are mentioned when calling his or her name. To address this problem, the researcher has to take the pain to learn all the titles of the rice farmers; show them respect when talking to them, and follow the cultural norms strictly during the interview sessions.

4.7. Data Collection Strategies

Various types of data collection strategies were used in the study. In this section, quantitative and qualitative data collection strategies will be discussed.

4.7.1. Quantitative Data Collection Strategies Questionnaires

Survey questionnaires (Appendix B) were used in the research in order to reach out to many rice farmers at the *Wasan* Scheme. The administration of the questionnaires was conducted by the researcher and with support from three (3) rice farmers, considered as research assistants. The research assistants were informed of the research and trained on the administration of the survey questionnaires. The entire data collection took place between May, 2010 and January, 2011.

Survey questionnaire as a data collection method is dependable in assuring that respondents remain anonymous in the research. It is also considered much more convenient for respondents. In addition, when administering questionnaire interviewer effects are minimal as compared to the qualitative interviews. This is because questionnaire administration requires a low level of administrative requirements (quicker to administer), and possesses a high degree of standardisation and accessibility (Robson, 2002, Sarantakos, 2005). With this strategy, Robson (2002) argues that interesting responses and underlying motives of the respondents are difficult to follow up and investigated. Similarly, Black (1999) also opine that researchers using survey questionnaire often lack control over the questionnaire completion process. Respondents, for example, may distort their answers due to social desirability bias and they may deliberately “fake good or bad” (Pole & Lampard, 2002; Robson, 2002; Sarantakos, 2005). As a good quality control measure, farmers were observed to see if their responses

reflected their actual farming practices in the *Wasan* Scheme.

Secondary Data

Numerous references were used to provide guidance and detailed data on the topic of economic diversification and agriculture in Brunei. Information on the history of rice agriculture was collected from journals published by the Brunei Museum and Information Department. On the other hand, information on agricultural policies were obtained from government policy documents namely the Brunei Annual Report, Brunei National Development Plans, Brunei Darussalam Master Plan 1986 Vol. 3 Crop Production, National Land Use Master Plan 2006-2025, Sectoral Study 5, 6, 7 and 8 on Agriculture and publications by the DAA and Department of Town and Country Planning. Recent information on rice cultivation was obtained from newspapers, while information on agricultural development in Brunei was collected from newsletters and publications published by the DAA under the Ministry of Primary Resources and Tourism (MPRT). Websites provide general information on agriculture (e.g. <http://www.agriculture.gov.bn>). Moreover, pamphlets and brochures published by the DAA gave details on the government's rice price support scheme and explanations about government related projects on agriculture and rice cultivation.

Statistics on agriculture was collected from the DAA and the Economic and Planning Unit of the Ministry of Finance.

4.7.2. Qualitative Data Collection Strategies

Two types of qualitative data collection methods are dealt with in this section: semi-structured interviews and observation.

Specifically, rice farming activities, schedules books and monitoring and control records are reviewed. This information enables the researcher to make informed decisions about the selection of informants. Observation of rice farms, for instance, informs the researcher about farmers who have big farms and active labourers. Likewise, farmers' records books and continuous monitoring and evaluation of rice farming activities gave information about the progress of farmers, rice farming activities, equipment used and the ones hired. With this information in mind, the researcher is well informed and can make appropriate decisions regarding informants' selection for the qualitative study. The

document study also generates important statistical data used for the discussion of the research findings.

Semi-structured Interview

One of the most important data collection method used in the study is semi-structured interviews. The interview-guide is not prescriptive or mechanistic such that it will make the rice farmers move from one point to another without being forced to follow the order of the question. The researcher, however, ensures that all the issues listed in the interview-guide were covered during the interviewing process and that the rice farmer takes the lead in the conversation.

Each of the interviews was arranged in a manner that paves the way for the researcher to achieve information redundancy (Lincoln & Guba, 1985). Before any interview or conversation with the rice farmers takes place, the researcher gives sufficient explanation of the objective of the study, the nature of the information required, what the data are to be used for and the potential benefits to the rice farmers and the country as a whole. Additionally, rice farmers were ensured of the confidentiality of any information disclosed, the anonymity of their identity and the researcher's professional responsibility to adhere to ethical issues that govern the collection and use of data.

Also, the researcher ensures to remain non-judgmental to the responses provided by the interviewees in order to reduce any potential biasing effect of the researcher (Johnson and Turner, 2003). Each of the interview sessions lasts for an hour or more and were held at the rice fields. All the informants refused to be videotaped or their voices to be tape-recorded. As a result, the interviews were written in the field notebooks and later transcribed. A summary of the interviews was made available to the rice farmers a week after the interview for any additional comments or deletion of any information they did not feel comfortable with appearing in the final report. The voices of the fifteen (15) rice farmers helped the researcher to attain data saturation and information redundancy (Onwuegbuzie & Collins, 2007) which provided the researcher with an indication to stop looking for more informants because 'data saturation' was already realised.

To answer research question one on the goals of *Wasan* Scheme, semi-structured interviews were also carried out for government officials from the DAA. This is because

information obtained from policy documents are not enough as officers are changing all the time and new staff do not have complete answers. They provided an insight into the development of wet-rice agriculture in general and *Wasan* Scheme in particular. Those interviewed were the Former Director of Agriculture and Agrifood, Director of Head of Agriculture and Agrifood and Heads of the two units mainly responsible for rice development; Rice Research and Development Unit and Brunei-Muara Agricultural Extension Unit. This interviews were conducted and were based on pre-defined themes, e.g. the rice cultivation and the utilization of land (see Appendix D).

Observation

Observation and open interviewing are the most efficient measuring tools that promised an insider's view (Brewer & Hunter 1989). Observation of rice farmers' fields and farming practices pave the way for the researcher to take care of the taken for granted data that are not captured during semi-structured interviews and survey questionnaire. The researcher can "...observe behaviour in natural settings in order to construct realistic theories, ideas that "work and fit" when applied and tested in the field" (p.77-78).

The researcher observes the fifteen (15) key informants in their rice farming practices such as observing the way land is prepared for rice cultivation, construction, and repair of bunds, the methods of rice planting, harvesting and threshing and pest control.

In conducting the observation particularly rice fields and practices, the researcher documents behaviours and practices that have potency in answering the research question (Cohen, et al., 2000). As important events and thoughts unfold, the researcher notes down the information in the fieldwork notebook. Finally, the data generated from the observation are discussed with the rice farmers for more clarifications of behaviours and practices that the researcher has not understood. The outcome of the discussion serves as a confirmation of the data generated from the interviews and observation.

4.8.Data Analysis

The collected data were analysed using quantitative and qualitative procedures of data analysis (see Figure 4.1). For the quantitative research questions, descriptive statistic, t-test, chi-square test of independence, and regression were used. In the case of the qualitative data, blended standard qualitative content analytic tools were used in the

analysis. The description of the data analysis procedures are presented below:

4.8.1. *Quantitative Data Analysis*

Data from questionnaires was transferred to a newly created document. In the process of transferring data, the researcher established commonalities and patterns among answers and was able to formulate an appropriate heading for specific answers. The specific headings were coded and then used to provide answers to research questions from the questionnaires (analysis). Various quantitative analytical tools were used to analyse the component of the collected data. First, the data generated to find out the salient characteristic of rice farmers in *Wasan* Scheme, were analysed using a descriptive statistic (means scores, standard deviation) coupled with percentages. The analysed salient characteristics took care of variations in farmers' age, experience, farm size, yield, seasonal expenses and income levels. Second, multiple regression analysis and t-test were also used to determine whether or not there is a statistical difference between average farms of Koseka and that of the Mukim farmers. Third, Chi-square test (χ^2 -test) of independence was applied to determine statistical association between productivity and farm size.

The effects of age, farm size, labour force (number of workers), variable cost and years of experience, on productivity of farmers in *Wasan* Scheme, were analysed using Ordinary Least Square (OLS) regression. Other collected data were analysed using descriptive statistic.

4.8.2. *Qualitative Data Analysis*

Three coding methods of grounded theory (open coding, axial coding and selective coding) (Strauss & Corbin, 1994) were used to analyse the qualitative data in order to meet the goals and nature of this study. To do this, the following procedures were strictly followed:

Open coding

The data analysis started by using the open coding system, which deals with the breakdown of data into smaller parts, close examination of the divided data, comparing and categorizing them (Strauss & Corbin, 1990). Therefore, to analyse the extracted data, first, the interview scripts were read to identify and code both implicit and explicit categories found in the data. This aids the researcher to open up theoretical possibilities the entire data carries. The reading and coding of the interview scripts were done line by

line, sentence by sentence or paragraph by paragraph or by coding the entire text to discover abstract concepts in the data and raising the conceptual level of the data. In coding the data, attention is paid to De Vos' (2005) recommendation on the comparative method of analysis of qualitative data analysis:

- a) Compare interviewees' responses and group similar responses together and label them.
- b) Then categorize the responses according to similar concepts and later group subcategories together and label them,
- c) Thereafter, categories are named according to what seem fit logically in each category, and
- d) Finally, categories are developed according to the research questions (De Vos, 2005).

Axial coding

The second stage of the data analysis, axial coding, involves finding relationships and connecting the conceptual categories identified at stage one of the data analysis (open coding). The relationships and connections between categories are found to bring together substantive codes or conceptual categories to generate new connections between main category (themes) and their sub-categories. It is a way of rebuilding new relationships between categories and sub-categories. To create the relationship between the categories and sub-categories, the following steps were utilized:

- a) First, the first order-categories were identified from the open coding procedures to enable further categorization of the data.
- b) Second, the identified "First order-categories" were then interconnected with each other to produce a set of propositions.
- c) Third, selective coding was then applied to the proposition to produce the core categories. This stage then paves the way for the stage of the data analysis.

Selective coding

The final stage of the qualitative data analysis depends on open and axial coding process, which was described earlier. Having broken up the raw data into conceptual categories and sub-categories (open coding); put the broken categories and sub-categories back together in conceptually different ways, the researcher then deliberately selects some

aspects as core and concentrate on them. At this stage, qualitative data analysis are then concentrated on the core categories. These categories become the centre-piece of the qualitative findings. Analysis at the third stage was done with the aim of developing a high-level abstraction, condensation and integrated picture of the research data. Therefore, the selective coding is done by:

- a) Finding higher-level concepts or categories.
- b) Finding a central conceptual category at the second level of abstraction.
- c) Ensuring that the central conceptual category emerge from constant comparisons, which is driven from the earlier coding methods, and
- d) Ensuring that the categories are clear and elaborated in terms of properties and systematically to other categories of the data (Punch, 2005).

4.9.Ethical Issues

The data collection procedures follow the principles and standards laid down by Brunei. First, permission to conduct research in the *Wasan* rice fields was sought from the heads of *Wasan* rice farmers and the DAA (refer to Appendix C). Although permission is granted by the relevant authorities in Brunei, this does not guarantee access to the rice farmers and information. Different arrangements were made to get access to the rice farmers to participate in the study.

4.10.Fieldwork Reflection

A number of problems were encountered by the researcher. These are described below.

4.10.1. Access to the Fieldwork Site

Permission that was granted by the DAA to carry out interviews and questionnaire with the farmers does not mean the researcher can easily interview the farmers. This is because having approval from the head of the group does not guarantee access and permission from individual farmers. Permission has to be constantly sought from individual farmers. The initial plans of adopting a solely quantitative approach by using questionnaires did not work as farmers were reluctant to answer and cooperate for fear that the researcher was from the Department of Immigration and was out to ambush them for hiring foreign workers under the guise of domestic quota.

Also, it was discovered that title or designation has to be adequately spelt out so as not to

offend the farmers. For example the title of *Pg*, or *Dato* that was bestowed by His Majesty and the rank particularly for Koseka farmers before retiring from the army. This particularly applies to the higher ranking army officers.

4.10.2. Semi-structured Interviews

When conducting interviews with either farmer(s) and/or agricultural officers, a lot of problems were faced. Firstly, respondents (farmers and agricultural officers) were mostly unavailable at the time of the researcher visits. Most of the farmers were not at the field as they relied on foreign labourers to do the farming activities and this created problems as the labourers refused to be interviewed. In the end, the researcher has to re-arrange the time to ensure that the farmers were at the rice fields. As a result, the time frame set by the researcher cannot be met.

Similar problems were faced when arranging meetings with certain officials from the DAA. The officials were either out of state, engaged in various commitments or official field visits to other agricultural development areas.

Secondly, some farmers tend to be too secretive about giving certain information, especially where income is concerned. They did not give the proper income level though it was understood that they received a certain amount. This may be due to cultural reasons which have existed for generations and could not be changed.

Thirdly, there was the issue of a lack of accountability and cooperation within and between government departments. The researcher was asked to contact certain unit in the DAA but was passed to another unit. At the end, the researcher was given details of the contact person that was initially given.

4.10.3. Survey Questionnaire

When administering the questionnaire, most farmers were reluctant to answer it especially when looking at the number of pages and the list of questions that were asked. Even for those who participated tend to give a simple and formal answers without elaboration for the questionnaire to be done quickly.

4.10.4. Secondary Data

In relation to printed materials relating to rice cultivation and production, the limitation was the non-availability of the materials and that some of the information was inadequate for references. In terms of access to materials, this was especially the case for past government rice development schemes reports and publications as the materials were either kept in the storeroom or were kept by the officers in charge of the project or scheme who have since retired. Even if the reports were available it was too brief, outdated and too general.

CHAPTER 5

Findings from the *Wasan* Wet-Rice Farming Scheme

5.1. Introduction

The aim of the chapter is to shed light on the issues faced by farmers, both *Koseka* and *Mukim* in order to gauge the success of the *Wasan* wet-rice farming scheme, and identify key catalysts and deterrents of the project. The study will inform relevant authorities and concerned parties such as agriculturalists and academics alike, and provide policy recommendation for successful agricultural projects in the future. This chapter will be divided into two major parts. The first part will focus on outlining the major goals of Wasan Scheme.

The second major section will be on presentation of empirical results from the analyses done in this study, with specific emphasis on relevant data to address the research questions posed at the beginning of the thesis, particularly questions 2 and 3.

- 1) What are the primary goals of the *Wasan* wet-rice farming scheme?
- 2) How successful has the *Wasan* wet-rice farming scheme been at achieving each of its stated (or implicit) goals?
- 3) What factors explain the success or failure at achieving these various goals, and how does this inform our understanding of development in raw material export dependent economies more generally?

The data presented in the second section are classified into the following sub-sections;

- A descriptive analysis of the farmers' relevant demographic information
- An overview of the farmers' farm inputs and yields
- A range of analyses to gauge of farmers' productivity and profitability
- Overview of issues that are faced by farmers

5.2. Goals of the *Wasan* scheme

The main data source to address this research question is derived from document analysis produced by the DAA, government national development plans (NDPs), Brunei annual reports and master plans. References are also made on the interview transcripts generated

from the interviews with the respondents who were and are closely associated with the establishment of *Wasan* project.

Document analysis particularly the National Development Plans has indicated that the *Wasan* project was created to achieve economic diversification (Fourth National Development Plan, 1980-1984). There were 8 strategies developed by the Government in the 1980s, namely:

- 1) a good long term 3-year cold storage for rice to replace the current 3-month storage at the Brunei State Store;
- 2) review the current rice subsidies;
- 3) a self-sufficiency target of 30% is considered to be realistic;
- 4) a pilot project in *Wasan*, large enough to start a large scale mechanisation to be followed by other large growing areas such as Kandol setting aside other areas for rice, tapioca, maize and sago in case of emergency;
- 5) acquire other rice areas in other countries such as Australia, United States and ASEAN for national rice import requirements;
- 6) continuously train all technical agricultural staff to upgrade their knowledge and skills using the latest technologies;
- 7) commercialise rice farming in the country by Government investing in young graduates and progressive private sectors; and
- 8) further secure our rice supply in case of emergencies using Future Markets.

Based on interview data, the *Wasan* Scheme rice project was first initiated by the government in 1978, as an experimental large scale mechanised wet rice planting project aimed at attaining rice self-sufficiency with the Agriculture Department responsible for managing the project. The project was also aimed at piloting rice planting twice a year, from April to September and from October to March. This was pointed out by a respondent who was the Director of Agriculture when *Wasan* rice project was conceived. He said,

The primary goals of the Wasan Rice Pilot Project were to boost local production that has fallen drastically from 60% in the early 1970s to about 3% in later years due to very severe drought in the beginning and socioeconomic problems later on. This was to be achieved through large-scale mechanisation as it was to be done in Wasan and other

large rice growing areas.

He explained that rice is a staple food in Brunei Darussalam and the *Wasan* project is part of the food security strategy in achieving the National Development Plan. At a later stage ‘food security’ has been emphasized by the government and the *Wasan* project is expected to contribute to the achievement of the goals along with other wet rice farming areas in the country.

The idea of *Wasan* as a pilot project was accepted by the government and a budget was set aside for the project to be implemented. However, after a number of years of operation the *Wasan* rice project failed to achieve its production targets and the project was abandoned in 1990. The *Wasan* Scheme was only revitalised in 2009 following the global food crisis in 2008 to address the Brunei’s national food security (as discussed in chapter 1).

The effort at diversifying the economy through the development of agriculture was further reinforced by a statement made by one of the ministers, YB Pehin Dato Hj Hazair who spoke to a gathering of youths attending a youth programme. The minister expressed his hope that they would become role models for other youths through participation in the development of agriculture of the country. He said,

“School leavers need to see that the field of agriculture, specifically rice planting and production, is one way they can earn money. It is also a business that can provide sustainable employment opportunities” (Rafidah, 2015).

In response to research question 1, it is apparent that the *Wasan* scheme provides an abundance of opportunities for both Koseka and Mukim farmers to explore the option of rice farming as part of the initiative to reach the implicit goals of the *Wasan* projects. Should the productivity of the wet-rice plantations reach its maximum capacity and potential (not yet reached by most of the farmers under this study), economic diversification is not too far-fetched and the nation will be able to reduce its heavy reliance on natural oil and gas as a sole source that drives the economy (should enough rice be produced for export). The success of the *Wasan* scheme will also improve food security/self-sufficiency in a national staple food, through high-yielding rice varieties, such as *Laila* and (the unofficial variety) *Titih*. An economically viable industry can also be attained via active involvement by local employment seekers to reduce unemployment plaguing the nation. Additionally, an increase in the personal income of both Mukim and

Koseka farmers is bound to spread all-round wealth via their subsequent donations to the poor and needy in the community. However, major strides will have to continue to realise these and other goals of the *Wasan* Scheme.

5.3. Farmers' Demographics

Of a total of fifty-two sampled farmers, thirty-six are retired army officers (Koseka) and sixteen come from the local villages (Mukim). The Appendix E, Table A1 displays all the variables and their definitions along with their hypothesized impacts on productivity and performance. In terms of gender, the overwhelming majority (forty-eight) are males with the remaining four being females, (one Mukim and three Koseka). There were only four female respondents therefore, due to a lack of statistical significance, the role of gender in *Wasan* farming activities will not be explored any further.

Age

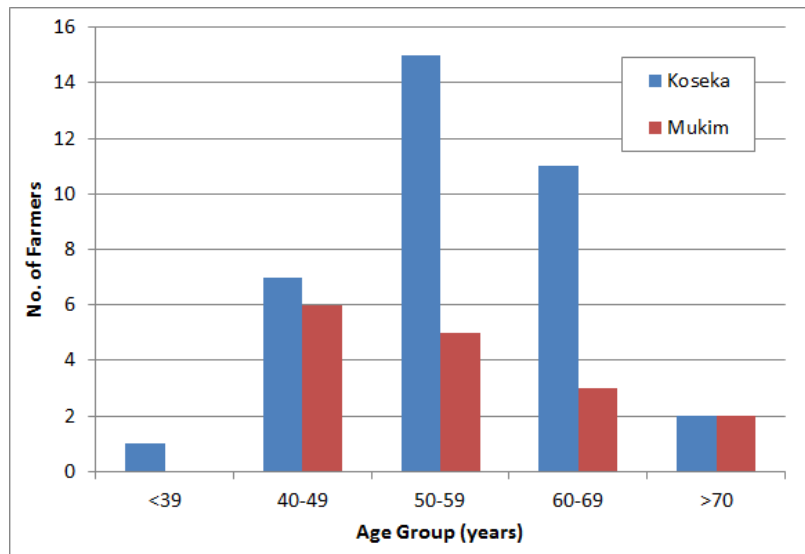


Figure 5.1: Distribution of farmers' ages

The distribution of ages of the farmers is given in Figure 5.1, showing a high frequency of elderly age groups involved in the *Wasan* scheme. Using the Student's t-Test⁴ (see Appendix E, Table A2) there is no significant difference between the average ages of the Koseka (54.7 years) and the Mukim farmers (57.0 years), ($p=0.44$). This scheme seems to attract elderly age groups over 40 years old. This finding is unsurprising for the military retirees who have decided to be involved with the industry upon retirement, wherein they are given the option of retiring after 18 or 20 years of service. However, the trend of the exclusive involvement of elderly farmers is also applicable to Mukim farmers, as all are older than forty years of age. The age of retirement from the public service is 60 years old, which is an increase from the previous 55-year retirement age. It may seem that the government incentives in the *Wasan* scheme attracted individuals to be involved in rice planting, and to continue to be a contributing member of the national economy. This begs the question of sustainability of the farming industry, and why there is no interest expressed by young age groups.

Education

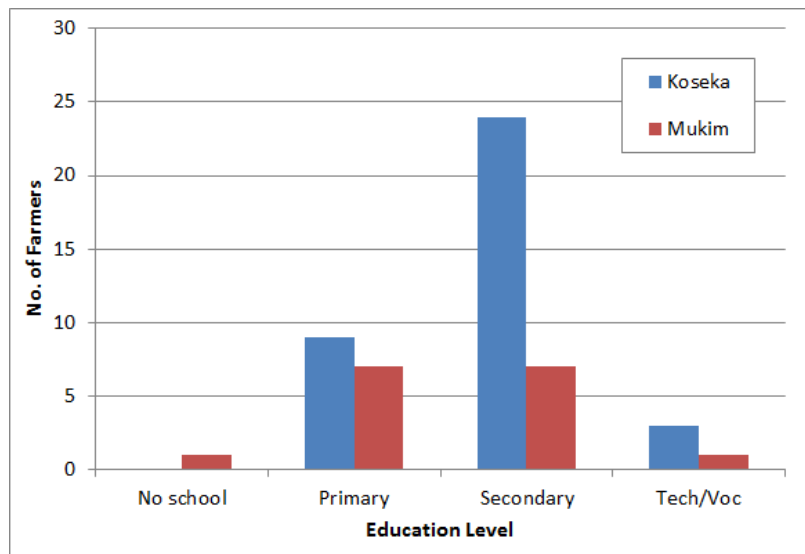


Figure 5.2: Distribution of farmers' education levels

⁴ The Student's t-Test looks to see if there is a statistically significant difference between the means of two sets of data. In this case we use a significance level (alpha) of 0.05 indicating that this research is looking for ninety-five percent confidence in the results not being by chance. Therefore if the calculated p -value is less than alpha, the research are ninety-five percent confident that there is a significant difference between the two means.

The highest education level attained by the farmers in each group is presented in Figure 5.2. Only one farmer, a seventy-eight year old Mukim farmer (born in 1935), had no formal school education. Of the remaining farmers, sixteen have up to primary school education, thirty have secondary school qualification and five have achieved technical or vocational level education. It seems as though the level of education does not have an impact on the mentality of the farmers. Across all levels of education attained, farmers are generally satisfied that they are able to witness the benefit of ‘having the ability to farm’ in feeding their respective family members, i.e. being able to carry out breadwinner’s role in the household, as demonstrated in the extract below:

“I did not have opportunity to go to acquire formal education. I do not regret because I am able to depend on rice farming to take care of my family”

Farmer No.14

However, in the grand scheme of Wasan wet-rice farming, it is important to abstain from adopting the mind-set of ‘no education, no problem’. This is because traditional practices of farming is on a purely subsistence level. There needs to be an encouraging pull, perhaps through specialised farming and agricultural education, to move to a more sustainable economic venture.

Farming Experience

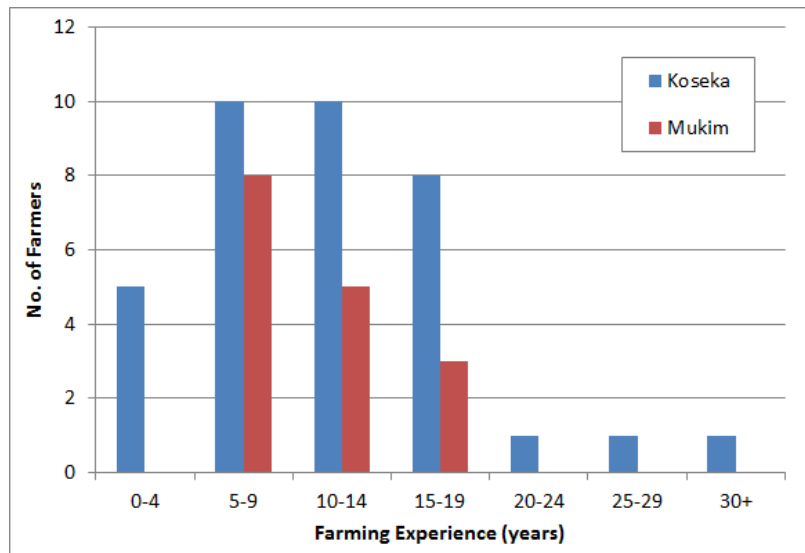


Figure 5.3: Distribution of farming experience

Each of the farmers was asked to categorize their years of involvement in the agriculture industry as a practitioner of the farming. Overall, only one farmer, an ex-military seventy-eight years old, considers himself to be a lifelong farmer with over sixty years of experience, whereas seventeen regard themselves as new to farming. The experience of the seventy-eight year old may be somewhat questionable, assuming that he started his military service at the age of eighteen. The majority of the respondents (thirty-four) stated that they are returning farmers, having had previous agricultural experience and left it for a period of time, presumably to attend to formal non-farming employment commitments. In fact, twenty-three Koseka think of themselves as returning farmers, despite having had military careers, as noted in below extract:

“Farming is not a new occupation to me. I used to follow my parents to rice fields when I was a child. I did that until I got recruited into the army. Now that I have returned to the same occupation, it is not a new thing to me at all”.

Farmer No.8

The histogram of years of farming experience as seen in Figure 5.3 shows a positively skewed distribution, indicating that there are significantly more farmers with relatively little experience in farming. This is supported qualitatively by all the rice farmers and one inexperienced farmer pointed out:

“I have no/zero experience in rice cultivation prior to Wasan Scheme. When I joined Wasan Scheme that was the time that I gain experience on rice agricultural activities. Furthermore, since joining Wasan Scheme, I attended the classes conducted by the DAA on rice activities and farm management.”

Farmer No.5

It is found that there is no significant difference between the average number of years spent in farming between the Koseka or Mukim groups (12.4 and 10.25 years respectively), ($p=0.43$)⁵. This finding is consistent with the qualitative component of the study, where many farmers disclosed that they did not have adequate experience in using modern tools and technology in farming. One farmer said:

“I have experience in becoming a rice farmer based on the traditional ways of doing rice planting. Furthermore, the experience that I had was based on planting traditional

⁵ See table A3 in appendix for the results.

varieties of rice planting both dry and wet season rice”.

Farmer No.8

Both qualitative and quantitative data for indicators of farming experience indicate that most farmers from both Koseka and Mukim have 19 years or less farming experience, and the source of knowledge for many of them is the DAA. Aside from that, they only have prior experience or knowledge in the old methods of farming, which may not be sustainable nor reliable in producing high yielding crops in this day and age of modern technology.

Farm size

There are two measures of farm size. The first describes the size of land under rice production during the main growing season while the second measure relates to the size of land during the off-season when a second crop of rice is grown. The off-season values consist of a combination of plot size under the owners name and, in some instances, includes plots under the name of their relatives, i.e. relatives who choose not to grow in the off-season and donate their land.

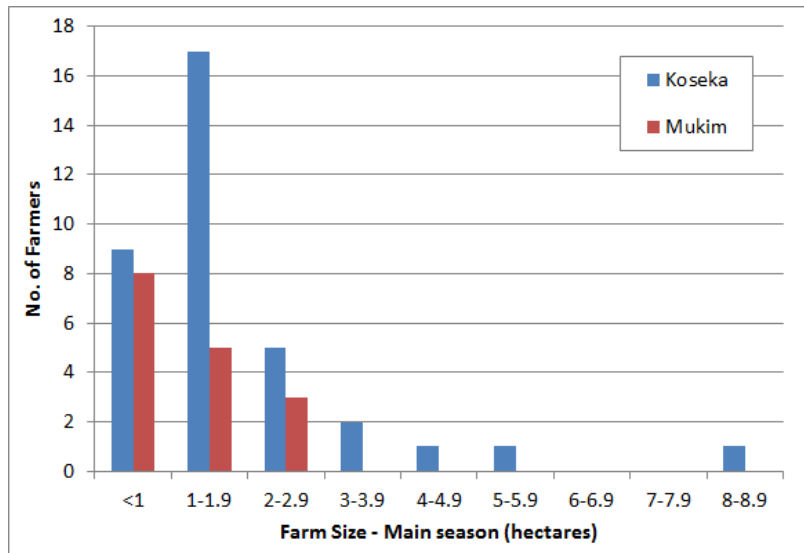


Figure 5.4: Distribution of farm sizes in main season

The average farm size for main season growing is 1.8 hectares with a minimum size of 0.6 hectares and a maximum of eight hectares. The distribution of farm sizes is given in Figure 5.4 showing a positively skewed distribution with thirty-nine of the fifty-two farms studied having a size of less than two hectares. There is a statistically significant

difference in the average size of Koseka-owned farms (2.0 hectares) from the farms owned by Mukim (1.2 hectares), ($p=0.02$) as shown in Table A5 of the appendix. Despite the Koseka's respective careers in the military, it seems as though the transition towards becoming farmers after retirement was aided by the availability of large plots of lands to be worked on as wet-rice production sites.

Findings from semi-structured interview revealed that for Mukim farmers can have more than 1 plot of land provided that they use their spouse/children's name to claim such entitlement. The reason for such a stark discrepancy in the allowable land use between the two groups is because Koseka occupies a larger area in *Wasan*.

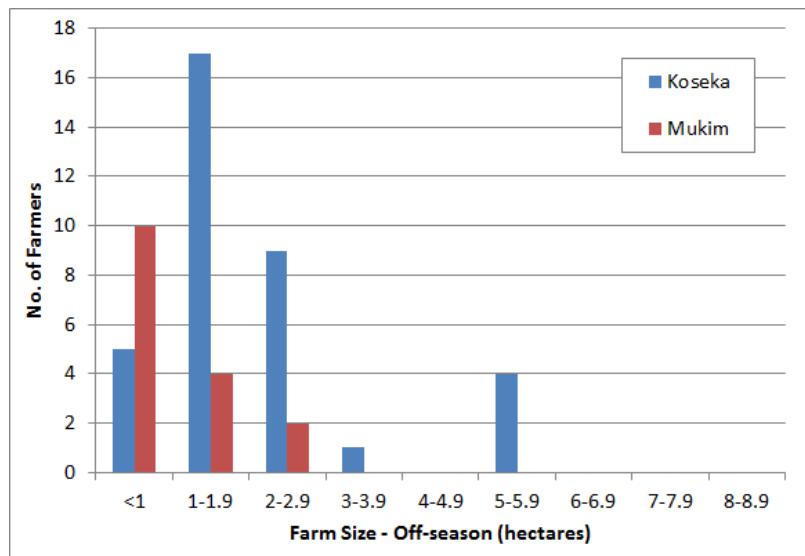


Figure 5.5: Distribution of farm sizes in off-season

On average, the farm size used in the off-season is slightly larger at 1.9 hectares with a minimum of 0.8 hectares and a maximum of 5.1 hectares. As seen in Figure 5.5 the land size is also positively skewed in the off-season. The average land size used during the off-season in Koseka is slightly higher at 2.2 hectares while those in Mukim use a similar average of 1.2 hectares. Statistically, this difference is significant based on $p=0.03$ obtained from the t-test shown in Table A7 of the appendix. The domination of smaller farm sizes can prove to be problematic as with smaller farm size, economies of scale will always be difficult to achieve.

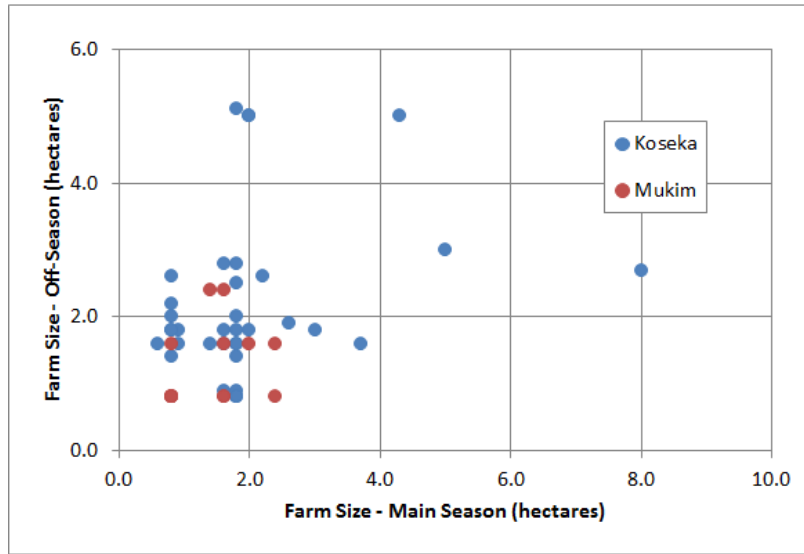


Figure 5.6: A scatterplot of main and off-season farm sizes

A scatterplot (Figure 5.6) displays the difference between main- season and off-season plots on a farm-by-farm basis. This indicates that for the larger farms, predominantly Koseka-owned farms, the size of land under rice cultivation is significantly larger during the main season, whereas for the smaller farms the amount of land under rice cultivation is significantly larger during the off-season. The circumstances that give rise to these findings are unclear, but clearly the size of the farms is one issue that needs to be examined in greater depth.

Non-farming income

Farmers from the two groups, Koseka and Mukim, have non-farming income as part of the sustaining feature of their involvement in their agricultural venture. The sources of these incomes come from a mix of old-age pensions (\$250 a month given by the government for citizens who are over the age of 60 years old), private or employer pensions and outside business interests. All farmers indicated that they received non-farming incomes with an average of nearly B\$2,800 per month and a maximum for one farmer of B\$17,000 per month. The distribution, seen in Figure 5.7 shows that the majority of the farmers' incomes are below B\$3,000, although a significant number have an additional monthly income of over B\$5,000. This is consistent with the qualitative findings where a sixty-three-year-old full-time rice farmer claimed:

“Apart from the income I get from rice cultivation, I have other sources of off-farm income. I still receive \$1700 per month as pension, and \$1000 from family-owned business every month.”

Farmer No.1

This indicates that there is a need for financial self-sufficiency on the part of the farmer in order to achieve at least some level of profitability, which concurrently enhances their commitment towards producing high yielding rice farms as they are injecting their own capital into the industry. This suggests the financial model for small-scale rice production is not sustainable.

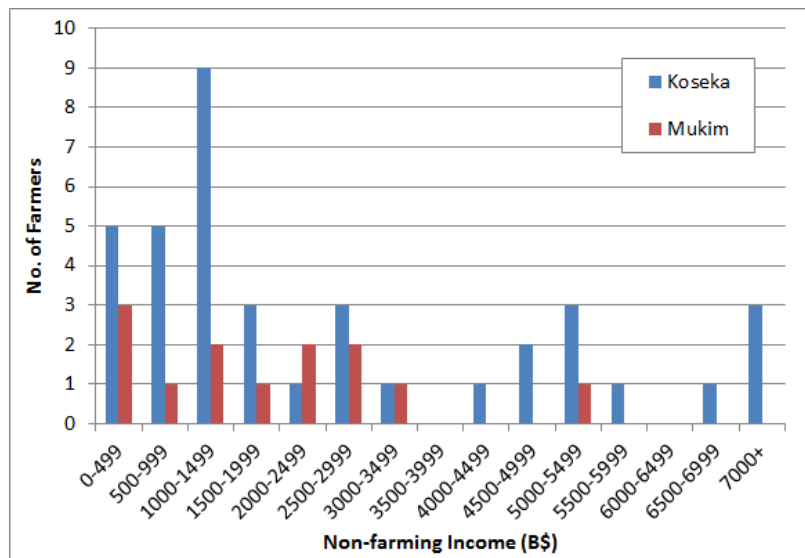


Figure 5.7: Distribution of non-farming incomes

There is no significant difference in the average non-farming incomes between the Koseka farmers (B\$3,325) and Mukim farmers (B\$1,562), ($p=0.07$), due to the very high variance of incomes. This high variation is a result of farmers having additional income from a wide range of sources as noted above. The availability of non-farming income helps the farmers to finance the agricultural inputs such as pesticides, insecticides, and machinery which can boost productivity.

Overall, the demographic profile of the farmers from the Koseka and Mukim groups show a continuum of characteristics in terms of their highest education attained and non-farming income. There are also predictable profiles such as the high tendency of older age group with relatively little experience and small plots of wet-rice planting lands to be

involved with the industry. The latter precludes the ability to achieve economies of scale for the Wasan scheme in general. These demographic tendencies and information will be used to develop an understanding as to why certain farmers may have less productive and less profitable farms.

5.4.Farm Inputs

This section describes the resources that farmers use in the Scheme by both Koseka and Mukim farmers. The resources can be broken down into three main groups; farm workforce, degree of mechanisation and other required farm resources (i.e. seeds, fertilisers and pesticides). The discussion in this sub-section will follow the order presented above.

Farm Workforce

In terms of farm workforce, two sources are utilised on the farms, namely foreign workers, (predominantly from Indonesia) and family members. As the following farmer disclosed:

“Family members only helped out during their free time as they are not interested in becoming rice farmers”.

Farmer No. 11

The farm labour force is dominated by foreigners because Bruneians prefer to work for the government where the perks, incentives and job security are more attractive. This finding is in line with the study made by Beblawi (1987) of rentier-type economies. According to this theory, there is an established mentality that dissociates the work-reward causation and reward-wealth relation to work and risk taking. Understandably, locals are not interested in doing manual labour especially when a more lucrative option is available to them. As a result, there is dependence on government-support and foreign workers to do the work.

Farm workers can be categorised as full-time, part-time or seasonal. Full-time, indicating a permanent status as an employee, part-time, indicating year-long employment but only on an intermittent basis, and seasonal workers who are utilised at specific times during the crop cycle. In some cases the respondents were somewhat vague in their responses

with answers being sometimes more qualitative than quantitative, e.g. “three to five”, or “two to six”. In these cases an average value was assumed in order to carry out further quantitative assessment.

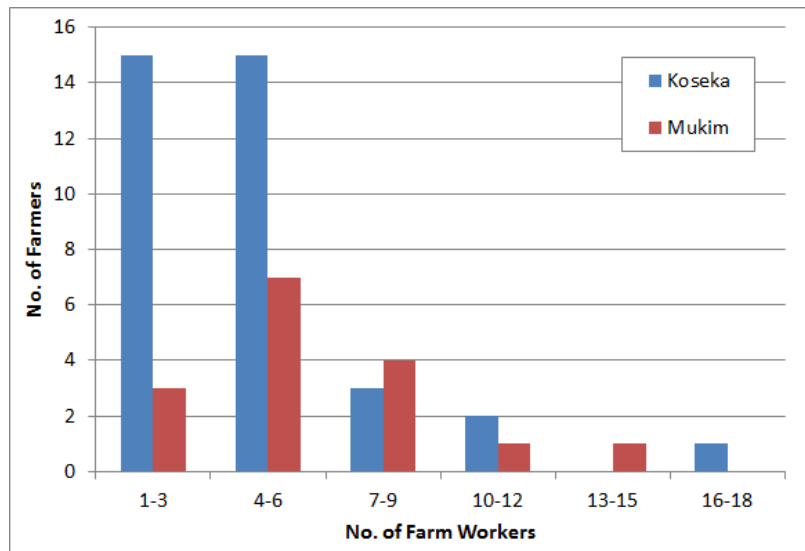


Figure 5.8: Distribution of number of farm workers

The initial analysis examines the number of farm workers overall and considers whether the two groups of owners (Koseka and Mukim) show any difference in their number of farm workers. Figure 5.8 shows the distribution of total workforce used by the two groups. While the average number of workers for each group shows a difference (4.7 for Koseka owners and 6.2 for Mukim owners), but the t-test conducted showed that these differences were due to chance ($p=0.07$).

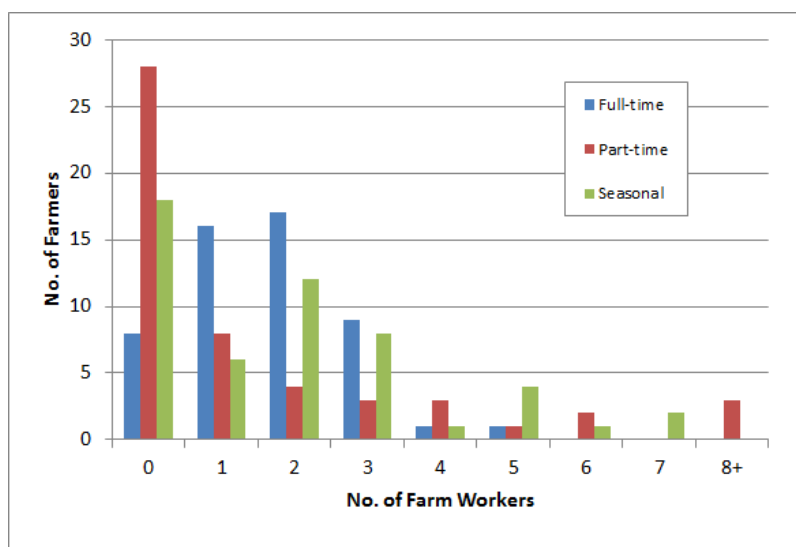


Figure 5.9: Distribution of number of farm workers categorised by their employment status

The total number of workers for each status obtained from the data demonstrates that overall there are more seasonal workers (ninety-seven) than full-time (eighty-six) or part-time (eighty-five) employed on these fifty-two farms and all farms have at least one worker. From Figure 5.9, it can be seen that the majority of farmers have a very small workforce across all types of workers, with a large number of farms having zero part-time workers or seasonal workers. The implications of this are that it can affect yield and productivity as farmers rely on part-time or seasonal workers.

Degree of Mechanisation

There are three stages of producing rice that can make use of machinery; ploughing, planting and harvesting. All the farmers state that they exclusively use machinery for ploughing, however planting and harvesting on each farm can be exclusively mechanical, exclusively manual or a mixture of the two. One of the rice farmers commented,

“It is very difficult to farm these days without using tractors. So, what we do is that we pay for the services of the tractors to plough the land for us. Then we do the planting and harvesting ourselves together with the labourers”.

Farmer no.12

Despite the varying degree of highest education attained and non-farming income, the reliance on machinery remains a consistent challenge in order to increase productivity and yield in their respective small plots of land. The lack of farming experience and the dependence on DAA as the sole source of knowledge in farming is also an issue that needs to be addressed.

Method	Koseka	Mukim	Total
Mechanical	25	5	30
Mixed	5	3	8
Manual	6	8	14
Total	36	16	52

Table 5.1: Number of farms showing different methods of planting

Source: Field data, 2010-2011

Method	Koseka	Mukim	Total
Mechanical	17	2	19
Mixed	4	4	8
Manual	15	10	25
Total	36	16	52

Table 5.2: Number of farms showing different methods of harvesting

Source: Field data, 2010-2011

Tables 5.1 and 5.2 shows the breakdown in the methods of farming for planting and harvesting respectively as well as the distribution between groups of farmers based upon whether they are Koseka or Mukim. Overall, the data demonstrates that mechanisation is used more for planting than harvesting (thirty farms tend to use mechanisation for planting while only nineteen farms used mechanisation for harvesting). For planting, more Koseka farmers (twenty-five) than Mukim farmers (five) make use of full mechanisation, whereas more Mukim (eight) than Koseka farmers (six) plant by hand.

This may be due to the Koseka farmers' ability to afford to buy or rent more machinery as they receive workers' pension as opposed to Mukim farmers who only received old-age pensions. The former is thus able to reduce the number of workers employed, as they have less need than farmers in the latter group that practices mainly manual labour. Furthermore, some Koseka farmers have been able to buy their machinery which they can then rent out to other farmers, which further increases their ability to afford machinery for their planting purposes.

A similar result is found for the harvesting process; although Koseka farmers have an approximate balance between mechanical and manual harvesting of crops (seventeen and fifteen, respectively), Mukim has a much larger number of farmers who harvest manually (ten as against two who have fully mechanised harvesting). This indicates that overall the Mukim farmers tend to use more traditional, labour-intensive farming methods. The likely implication of such practice is that the time spent for harvesting will be longer compared to using full mechanisation. As a results, the longer it takes to harvest, the more likely the yield will be affected.

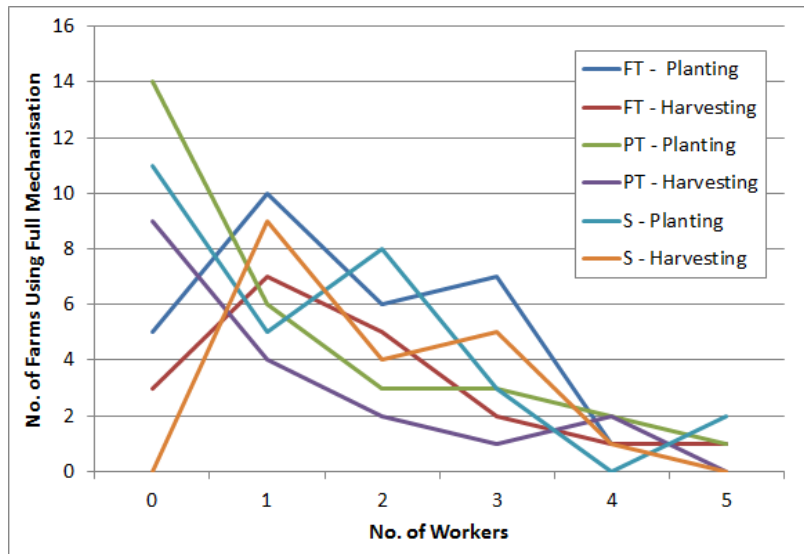


Figure 5.10: Relationship between number of workers on each farm (FT = full time, PT = part time and S = seasonal) and the number of farms using full mechanisation for planting and harvesting

The existence of any significant relationship between the degree of mechanisation and the number of labourers on each farm (i.e. do farms with fewer labourers use more mechanisation?) is explored using Figure 5.12. As can be seen from the line plot, with the

exception of some farms with zero farm workers of a particular type, there is a general negative relationship indicating that farms with larger numbers of farm labourers use less mechanisation for both planting and harvesting. This is consistent with the idea proposed earlier that supports the statement that there is a negative relationship between the number of farm workers and the amount of mechanisation involved in the process of farming. The result is also consistent with the idea that there is a negative correlation between the off-farming income of the groups of farmers with the number of labour force employed.

As part of the government incentives to farmers under the *Padi Assistance Scheme* introduced as part of the Fifth National Development Plan (1986-1990), the government provides subsidies for machinery and agricultural inputs (pesticides and fertilisers). Table 5.3 shows the sources of machinery for either purchase or rental, obtained either officially (government) or unofficially (private sector) within Brunei or overseas.

Table 5.3: Source and location of machinery by purchase and rental

Panel A: Source of Machine Purchase				
	Official	Unofficial	Both	
Koseka	6.9%	65.5%	27.6%	
Mukim	43.8%	25.0%	31.2%	
Panel B: Location of Machine Purchase				
	Overseas	Brunei	Brunei Overseas	&
Koseka	18.5%	63.0%	18.5%	
Mukim	22.2%	77.8%	0	
Panel C: Source of Machine Rental				
	Official	Unofficial	Both	
Koseka	2.9%	47.1%	50.0%	
Mukim	14.3%	57.1%	28.6%	
Panel D: Location of Machine Rental				
	Individual	Co-operative	Company	
Koseka	71.9%	21.9%	6.2%	

This table shows the source and location of machine purchase and rental for the two farm groups.

Source: Field data, 2010-2011

In terms of purchasing machinery, the major difference between the Mukim and Koseka farmers is that the former tend to source their machinery through official Bruneian suppliers, which is 43.8%, whereas the latter tend to source theirs through unofficial Brunei suppliers, 65.5%. A much smaller number, predominantly Koseka farmers, source their machinery purchases from overseas, 18.5%.

When renting machinery, both groups tend towards renting on an individual basis (over 70%) although a small minority rent direct from either a company or from a local farming co-operative. The purchasing of machinery from unofficial sources and individual renting allows for a greater degree of flexibility with regard to the pricing and terms of the rental agreement. This data indicate that government support is inadequate as farmers have to purchase or rent machinery unofficially. This aligns with the earlier proposed idea that in order to sustain farming initiatives, the farmers themselves have to have a stable off-farming income, which adds to the growing criteria of having to have self-sufficiency, initiative and innovative mind-set in order to be a successful farmer even in the *Wasan* scheme.

Other farm resources

There are three other major resources required for rice cultivation; seeds, fertilisers and pesticides, with the relevant proportions used shown in Table 5.7. All rice farmers disclosed that they received supplies from the Department of Agriculture and Agribusiness (DAA) at a subsidized prices.

A forty-nine-year-old rice farmer shared his experience:

“I always receive seeds, fertilisers and pesticides from the government. In case, I don’t get pesticides and fertilisers from the government, I buy them from Asia Enterprise [shop selling agricultural items]. For example, I bought a Kubota from the government at a subsidized cost to plough and plant rice on the land. For harvesting, I use a manual method. The reason for the usage of Kubota in ploughing and planting was because the manual method was slow.”

From the extract, it was noted that the government does provide aid in the form of the

provision of seeds, fertilisers and pesticides to farmers. In addition, farmers are also given subsidies for equipment such as tractors (for example the Kubota tractor mentioned in the extract) for ploughing and planting purposes.

However, at times, they buy the supplies such as fertilisers and pesticides from other sources, as demonstrated in Table 5.4 below:

Table 5.4: Source and location of supplies for seeds, fertilisers and pesticides

Panel A: Source			
	Official	Unofficial	Both
Seed	63.5%	32.7%	3.8%
Fertiliser	48.1%	0	51.9%
Pesticides	25%	0	75%
Panel B: Location			
	Brunei	Abroad	Both
Fertiliser	77.8%	11.1%	11.1%
Pesticide	71.8%	12.8%	15.4%

This table shows the source and location of supplies for seed, fertiliser and pesticides

Source: Field data, 2010-2011

There is little difference between the groups of owners with approximately 64% of owners sourcing seed through official government suppliers as shown in Panel A of the table. The remainder source their seeds through unofficial suppliers, whether through themselves, family or friends. As presented in panel B, the predominant source of fertiliser is from domestic suppliers (77.8%), whether from official, government-backed or unofficial sources, rather than overseas suppliers. Approximately half of the farmers (that is, 51.9%) source their fertiliser from a mix of official and unofficial suppliers while the other half deal exclusively with official suppliers.

Patterns for pesticide supplies are similar to that of the fertilisers, wherein they are predominantly sourced from domestic suppliers (71.8%), although in this case the majority, that is 75%, tend to source from a mix of official and unofficial suppliers rather than exclusively official suppliers. This reflects the more flexible open-market approach for the need for pesticides, which can vary rapidly through different seasons and

conditions.

In general, these trends give a strong indication that government support in terms of providing other agricultural inputs, including seeds, fertilisers and pesticides, as part of its incentives to attract citizens to do rice farming is still inadequate. Farmers still have to resort to unofficial sources for supplies. This trend of self-sufficiency has already been noted in previous discussions where farmers from both groups, Koseka and Mukim, have to have a stable off-farming income, and practice extensive flexibility in obtaining and renting relevant machinery in order to be a successful farmer in the *Wasan* scheme. This flexibility is also extended in purchasing other supplies for agricultural success. Farmers are seen to be proactive to changing operational requirements.

5.5.Productivity and Profitability

This section examines varying predictors of productivity and profitability of Koseka and Mukim farmers. For productivity, indicators include yield and the amount of the yield sold to the government's 'buy-back' scheme. The 'buy-back' scheme was introduced as a Brunei government policy encouraging the development of rice agriculture whereby farmers sell their produce directly to the government at a set price of B\$1.60 per kilogram. The yield will be divided into the two growing seasons; the main-season and the off-season production. A cross-comparison between the two seasons will also be made to provide a clearer picture of the productivity of farmers.

In terms of profitability, discussions will include considerations of relevant factors such as the relationship between the number of workers and the size of the farm, and the correlation between farm workers and non-farming income, which affects the profitability attained in farms. In turn, discussions on seasonal expenses, main-season and off-season income will then follow, along with the investigation of correlations between farmers' demographics (explored in 5.2) and characteristics (explored in 5.3), and their effect on farm productivity and profitability.

Main season production

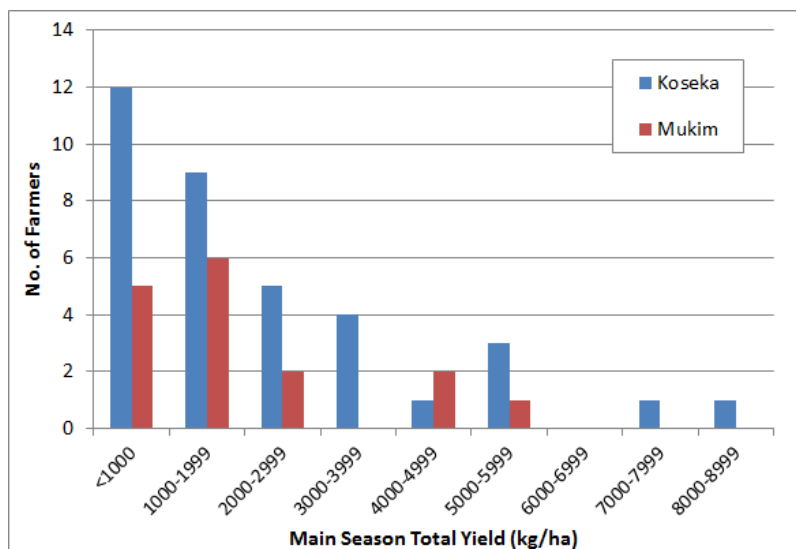


Figure 5.11: Distribution of main season farm yields per hectare

The fifty-two farms cover a total area of just over ninety-two hectares and, according to the survey, produce a combined main season harvest of 164,172 kilograms of rice giving an average yield of approximately 2,180 kilograms per hectare. However, there is a wide range of yields in the main season with three farms producing no output and the most productive farm yielding over eight thousand kilograms per hectare, over four times the average yield, indicating the possibility of quadrupling the total main season yield to somewhere in the region of 650,000 kilograms. The positively-skewed distribution of yields can be seen in Figure 5.15 where the majority of farms (thirty-two) produce yields of less than two thousand kilograms per hectare. There are no significant differences in yields per hectare based upon owner (Koseka or Mukim), ($p=0.63$).

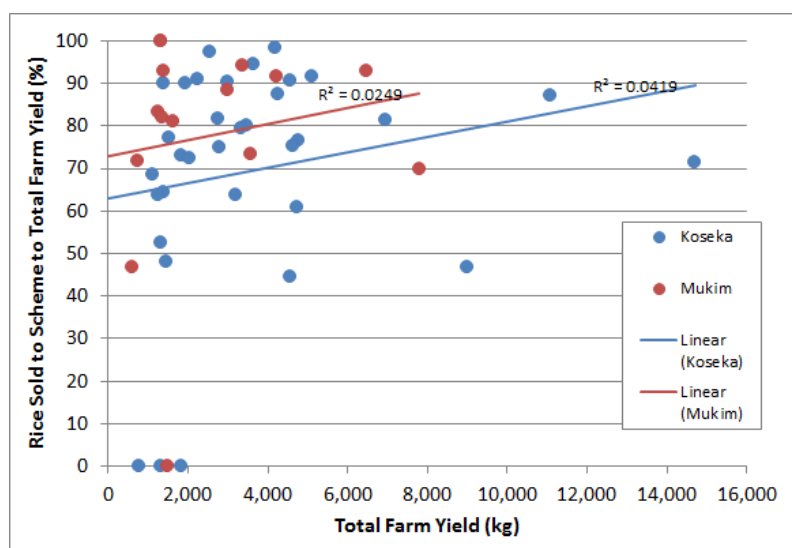


Figure 5.12: Scatter plot showing relationship of total main season farm yield to the percentage of that yield sold to the government purchasing scheme

The data in Figure 5.12 shows that the percentage of rice sold to the scheme as a total amount of harvested rice ranges from zero percent (four farmers), i.e. they sell all their rice on the local market, to one hundred percent (two farmers) where they sell all their produce to the government buy-back scheme. One farmer justify the decision of selling harvested rice to the local market:

“I sell rice so that I can receive immediate cash to pay my workers, to buy fertilisers and other inputs. If you sell to the government, it will takes four months. You need money to use back for farming”.

Farmer no.4

The extract demonstrated that the rice farmers prefer to sell their rice in the local market because they get a better price when sold at the local market and also get immediate cash rather than wait for long periods to receive payment from the government. In some instances, the local markets even double the government’s price of rice. They said that local market offers them a better deal than the government since the demand for the rice (*Laila*) is higher than the supply. As a result, some farmers do not even want to entertain the idea of selling their products to the government.

There are also instances where farmers still sell their products to the government as reflected in the following statements quoted below:

“This year I got a total output of 828 kilograms from rice farming activities. I sold 470 kilograms of it to the scheme for a total amount of \$752. The remaining yield was then used for own consumption while some were given out as ‘sedekah’[donation] to my siblings”.

Farmer no.8

“I prefer to sell my rice to the government purchasing scheme because it does not involve much work such as winnowing and drying the rice under the hot sun and then sending it to a private milling centre to get unhusked rice”.

Farmer no. 11

Despite the claim that the local market offers a better price for the rice produced, these two quotations above presents a varying outlook on the government’s buy-back scheme.

The first quote demonstrates that the buy-back scheme gives a fair amount of income for the farmers, and there is even excess for self-consumption and more to be shared with extended family members in the form of alms or “*sedekah*” or donation. The second quote indicates that farmers saw the scheme as an easier option to get their produce purchased than selling it to local markets where more processes have to be undergone prior to presenting it to potential buyers. These extra processes inherently also comes with added expenses on the part of the farmers, which some may wish to avoid and hence chose to sell their produce to the government.

Figure 5.12 also examines the relationship between the total rice produced by each farm and the percentage of the produce that is sold to the government’s buy-back scheme. The data suggest that, with the exception of the four low-producing farmers who sold no crops to the official purchasing scheme, there is a weak trend indicating that those with higher yields tend to sell a greater percentage to the government scheme. However any relationship between the variables is very weak as seen by the low r^2 values. One explanation may be that the local open markets can only sell a limited amount, so once the local markets have been supplied the remainder goes to the government’s scheme.

It is worth noting that all the rice farmers held a similar opinion when it came to the distribution of farm products. They all made sure that they left a significant portion of the yield for self-consumption. From a discussion with the rice farmers, a fifty-two year old farmer disclosed that he gained a total output of 1,981 kilograms and sold 1,736 of the output to the Wasan Scheme for a payment of \$2778. The remaining 245 kilograms from the output was used for family consumption and *sedekah*. One farmer further responded that he, “set aside a portion of the rice for [his] family so that [he] in a way save income and spent less on buying imported rice”.

Figure 5.13 below shows the trend for consumption of produce by the farmers themselves. From the trend lines, the scatter plot shows a negative relationship for Koseka farmers and a positive relationship for Mukim farmers. In general, famers with high yields consume more rice produce than those with low yields, which is an expected outcome. The average own consumption is 104.29 kg/h, approximately 7.03% of the yield produced.

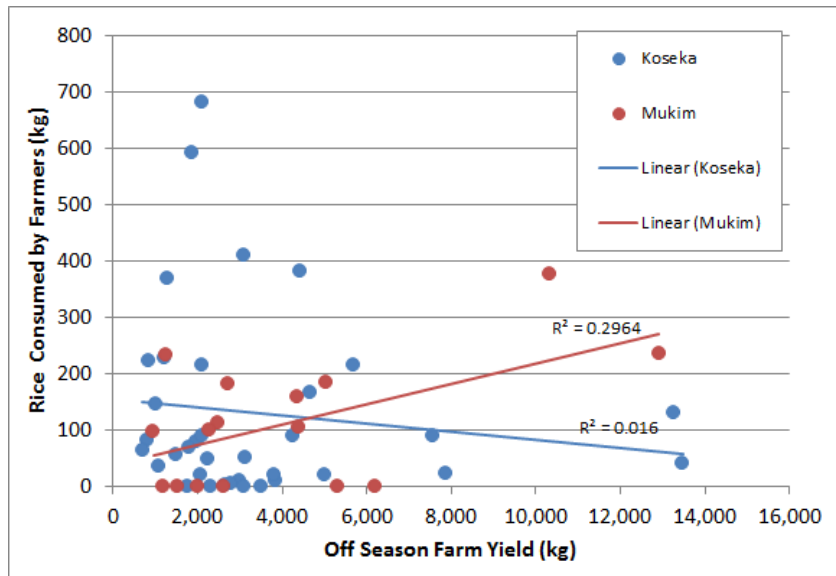


Figure 5.13: Scatter plot for off season yield and amount of yield consumed by farmers

In terms of the farming groups, the mean own consumption by farmers in Koseka is 91.22kg/h (7.56%) and those in Mukim is 142.32kg/h (5.50%). This indicates that Mukim farmers have the tendency to self-consume more than Koseka farmers. However, in statistical terms, there is no significant difference between the mean own consumption by the two groups ($p=0.18$). This means that the difference recorded are due to chance, and both Mukim and Koseka farmers produces rice for their own consumption at similar rate of 7.03% of the yield.

Aside from self-consumption, as part of their religious obligations, some farmers choose to give a portion of their yield as ‘sedekah’ or alms/donation to the needy. Although this activity involves them giving away, it in a sense represents some non-pecuniary gain that accrues to them from the religious perspective. Such good deeds are considered to receive extensive rewards in the hereafter.

One of the farmers stated that *“the sedekah we give out to people are not only meant for our family members, but also we give out to people who do not have enough. This is the way we can also contribute to the society”*.

Another respondent even strongly argued that, *“giving out sedekah is something that cannot be counted and valued. How much I gave should not be spoken about for sincerity and to get extensive rewards in the afterlife”*.

The extracts demonstrate the high regard held by farmers in giving a portion of their production to ensure the welfare of others in the form of donation. There are still excess, after self-consumption and donation, for farmers to obtain profit in the buy-back scheme of the government and the selling of produce in the open-market.

Off-Season Production

The amount of farming land used by the fifty-two farmers increases slightly in the off-season to ninety-seven hectares which produce a combined harvest of just under 190,000 kilograms of rice with an average yield of 2,050 kilograms per hectare, slightly below the main season yield per hectare. During the off-season, all farmers produced a crop, with the lowest yield per hectare being 387 and the maximum being 5,425. Once more, the distribution shown in Figure 5.14 is positively skewed, with the majority of farmers (twenty-nine) having yields of less than two thousand kilograms per hectare. As shown in the appendix Table A8 during the off-season there is a statistically significant difference ($p=0.00$) in average yields per hectare between the Koseka farmers (1,590 kg/ha) and the Mukim farmers (3,090 kg/ha). The reason for higher yields during off-season for Mukim is because a few Mukim farmers were planting a hybrid rice variety *Titih* on a trial basis, in which the average yield is more than that of *Laila*.

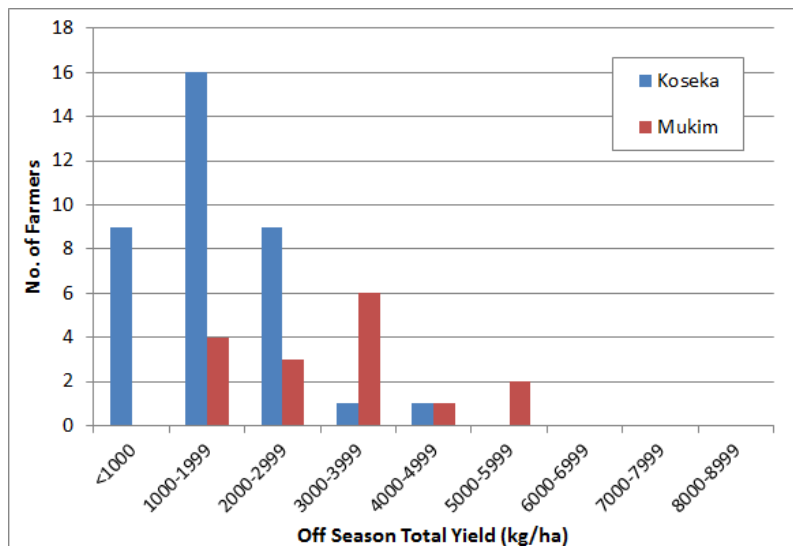


Figure 5.14: Distribution of off season farm yields

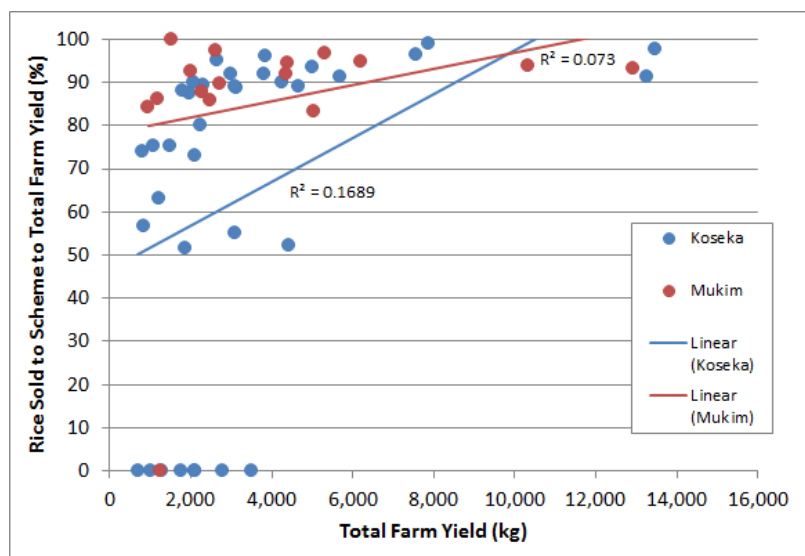


Figure 5.15: Scatter plot showing relationship of total off season farm yield to the percentage of that yield sold to official purchasing scheme

From Figure 5.15 it can be seen that in the off-season there is a slightly stronger relationship between the total yield from each farm and the amount of rice that is sold to the government purchasing scheme. Farmers who have lower yields tend to sell a smaller percentage of their rice to the purchasing scheme. This may be because they see themselves more as smaller subsistence farmers and therefore tend to sell their produce locally rather than become involved in the large government scheme.

A typical response given by many farmers on this subject is that “*since my yield is low, I would rather keep the rice for my family’s consumption and give some as sedakah [donation]*”. This is seen to be rather contradicting to the tendencies of the farmers selling habits during the main season discussed above wherein there were farmers chose to sell to the government due to the fair amount of income, hassle-free and relatively economical processes. This could be that the low yields produced during this season still allows for high amount of profit despite the extra steps that needs to be done prior to selling the rice in the open market. Considering the fact that the local market can offer up to double the price set in the buy-back scheme, the expenses for the extra processes such as winnowing and drying the rice, and sending them to milling centres might still yield better income for low yields.

Main-Season Income

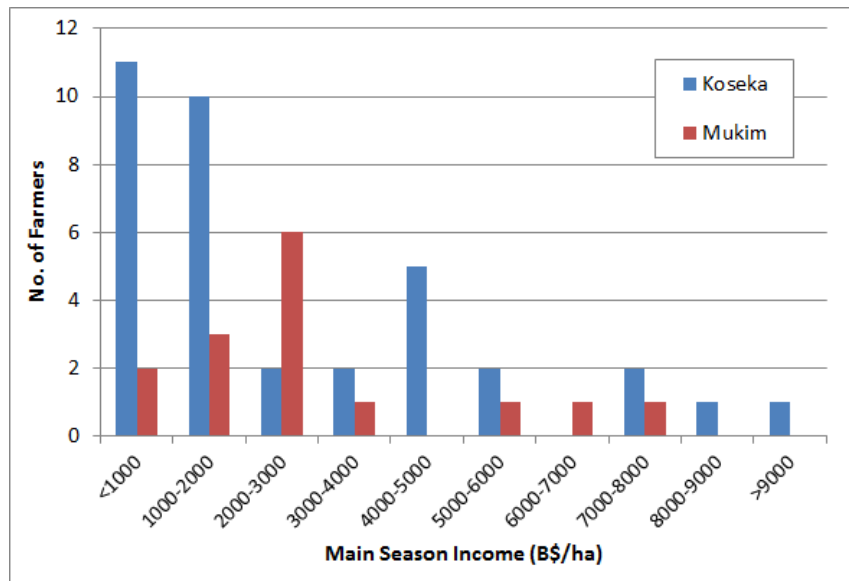


Figure 5.16: Distribution of main-season income per hectare

Figure 5.16 shows the overall distribution of the main-season income across the groups, which range from \$0 to \$9,333 per hectare. The distribution is also asymmetric where most of the values are below the mean income per hectare, \$2,700. The mean incomes for the two groups are also different, that is \$2,638 and \$2,836 for Koseka and Mukim farmers respectively. This shows that Mukim farmers earn slightly more than the Koseka farmers per unit area of land. This is possibly because a few Mukim farmers are growing

hybrid rice, *Titih* which yield an average of 8 mt/ha compared to the high yield variety, *Laila* which yield an average of 3 mt/ha. However, the independent t-test results, $p=0.593$, shows that the difference is not statistically significant (see Table A9 in the appendix).

It is important to note that in Figure 5.16 there is the wide range of values for yield per hectare. The upper values of above \$5,000 per hectare, which is achieved by six Koseka farmers and three Mukim farmers, demonstrates the potential yield that is attainable for farmers if the best practices in farming are adopted. However, given that the average land size per farm is less than two hectares, the sole dependence on DAA farming knowledge, the lack of experience in farming, and self-sustaining farming input primarily relying on off-farming income, the likelihood of attaining the maximum potential is rather unlikely. The current practices would still only result in a farming income of approximately \$10,000 per main season, which, after accounting for operating costs, (e.g. labour, seeds, etc.) may be deemed insufficient as a major source of income.

Off-Season Income

Farming activities and income are not only restricted to the main season but also in the off-season. A steady stream of motivation in the form of income in both the main- and off-season enhances the likelihood of a sustained practice and commitment towards better, and later best, practices in farming in support of the *Wasan* scheme.

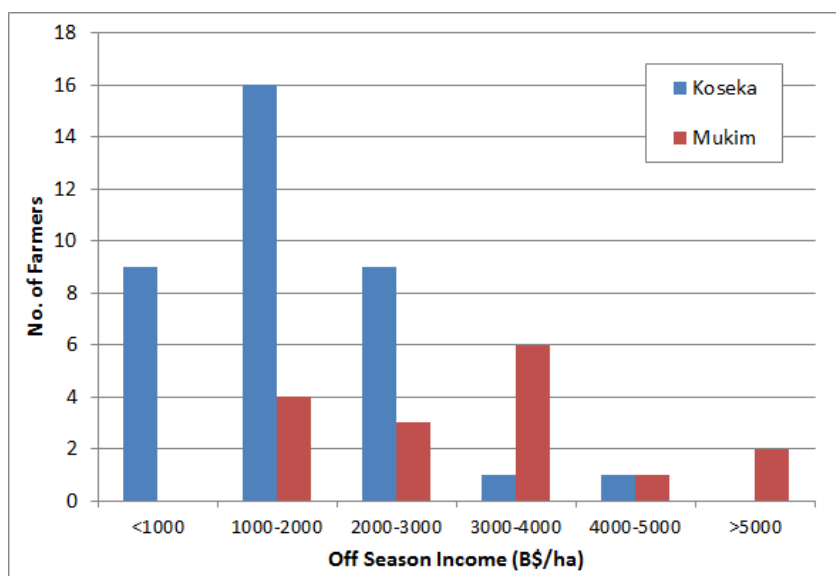


Figure 5.17: Distribution of off-season income per hectare

Figure 5.17 shows the distribution of the off-season income across the groups with mean income per hectare of B\$2,050, and ranges from B\$390 to B\$5,400. There is considerable variation in off-season income per hectare for the two farming groups, that is, B\$1,590 and \$3,090 for Koseka and Mukim farmers respectively. Figure 5.17 also shows a significant dispersion within the farming groups. The t -test ($t=-4.31$, $p=0.001$) indicates that the observed differences is not by chance (see table A10 in the appendix). Therefore, the off-season income per hectare is statistically different between the two farming groups. This is possibly due to Mukim farmers growing another variety of rice *Titih* during the off-season period, compared to the Koseka's practice of only planting the *Laila* variety for production. The high-yielding rice variety and the simultaneous dual- variety planting practice increases the income for farmers from the Mukim group during the off-season period. Thus, in order to continue sustaining the farmer's income during the main and off seasons from rice production, it is important to consider a range of variety of rice to be planted simultaneously, such as that done by the Mukim farmers and not only confine the farming option of one rice variety. This benefit is especially prominent, although done in a short-term and experimental manner, when testing high yielding rice varieties.

*Seasonally-based Comparisons of Production***Table 5.5: Average yields from farms for main and off seasons**

Average	2,180	2,050
Std Dev	1,940	1,220

Source: Field data, 2010-2011

From Table 5.5 it can be seen that the average yield per hectare is slightly smaller in the off-season than the main growing season, decreasing the yield by six percent, with the off-season standard deviation showing a more consistent yield across the farms. The data includes those farms with no harvest in the main season which will reduce the total yield per hectare for that season and will also contribute to the relatively higher standard deviation. Excluding the non-productive farms, the main season total yield per hectare becomes 1,777 kilograms, below the off season-figure.

The differences in average yields between the two growing seasons are negligible. This is probably due to the wide usage of irrigation, fertilisers and pesticides which allow for round-the-year growing. If the supply of farming supplies can be made dependable and affordable, this makes the case that further increases in yield can be made as the seasonality has little or no impact on yields.

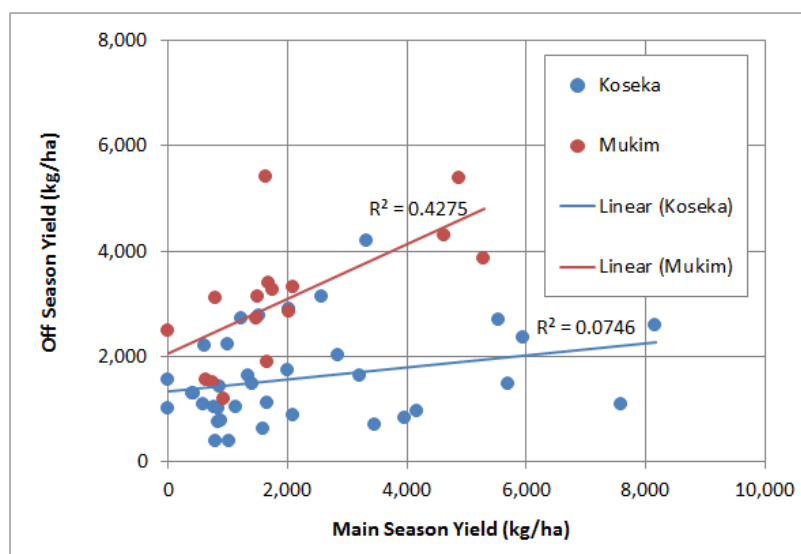


Figure 5.18: Scatterplot showing seasonal comparison of farm yields

On a farm-by-farm basis Figure 5.18 shows how the yield from each farm compares between the two seasons. There is a very weak relationship in farm yields between the two seasons for Koseka farmers ($r^2=0.07$) but a much stronger one ($r^2=0.43$) for Mukim farmers, indicating a more consistent yield over the two seasons for the latter group of farmers. It also worth noting that the Mukim farmers with smaller yields tend to have larger off-season yields compared to their main season yields. In contrast, the Koseka farmers with large yields tend to have considerably larger yields during the main season compared to their off-season. The explanation for this issue needs further investigation.

Factors Affecting Income

The profitability of any business, including farms is based upon the balance between costs and sales. These can be broken down into smaller components, e.g. fixed and variable costs, but for this research the profitability value simply takes the difference between estimated annual costs and annual income. Profitability is an important measure of farmers profit as it is not viable to expect farmers to be simply more productive; they also need to be able to increase their profits as a result of their improved productivity. Factors which can be considered a part of the estimated annual costs which affects the net income of farmers from rice production include the number of farm workers, and the farm sizes, which will be discussed below.

Number of farm workers and non-farming income

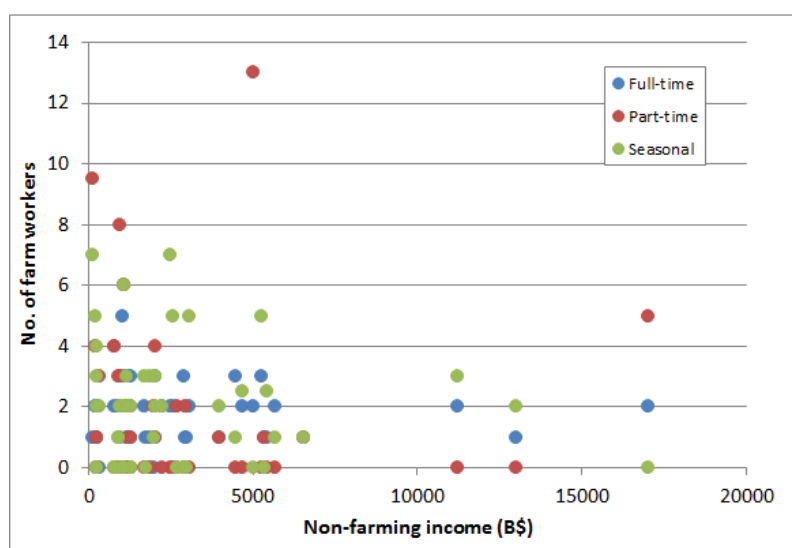


Figure 5.19: Scatterplot of non-farming income against number of farm workers employed

The number of part-time and seasonal workers employed depend on financial status (capital) of rice farmers. Farmers who have additional non-farming income have the funding to hire more workers. However, there appears to be a generally negative relationship between the amount of non-farming income and the number of farm workers employed. This could be explained by the fact that those with greater funding resources are in a position to afford greater use of mechanical resources. Since mechanical resources are seen to be a one-off purchase, when compared to the hiring of part-time and seasonal workers, the income from farmers who have high degree of mechanisation are able to reap off higher profitability than those who still depend on the hiring of human resources.

Number of farm workers and farm size

The correlation between the number of farm workers and farm size was also examined as these factors also affect the profitability of farms, and the results are presented in Table 5.6 and Figures 5.20 and 5.21.

Table 5.6: Correlation (r) of number of farm workers with size of land under rice production in different seasons

Type of Labourer	Main Season	Off Season	Total
Full-time	0.06	0.33	0.23
Part-time	0.05	-0.11	-0.03
Seasonal	-0.11	-0.24	-0.21
Part-time seasonal +	-0.02	-0.22	-0.14
All labourers	-0.01	-0.11	-0.07

The table shows the correlation between the number of different type of farm workers and the size of land under rice cultivation for the two seasons.

Source: Field data, 2010 - 2011.

In all cases the correlations can be considered relatively weak, with eleven out of the fifteen correlations being negative indicating that larger farms overall use fewer labourers than the smaller farms. This is consistent with the previous result from the correlation between the number of workers and the off-farming income, whereby it was predicted that farmers with high off-farming income, presumed to have larger plots of land for rice production, have less need of manual labour and practices a higher degree of mechanisation than those with low off-farming income with small plots of land.

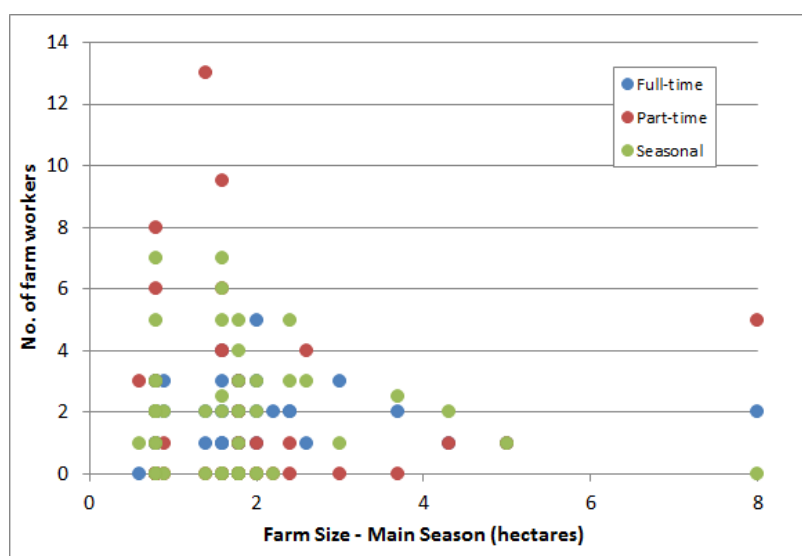


Figure 5.20: Scatterplot of farm size against number of farm workers employed during the main season

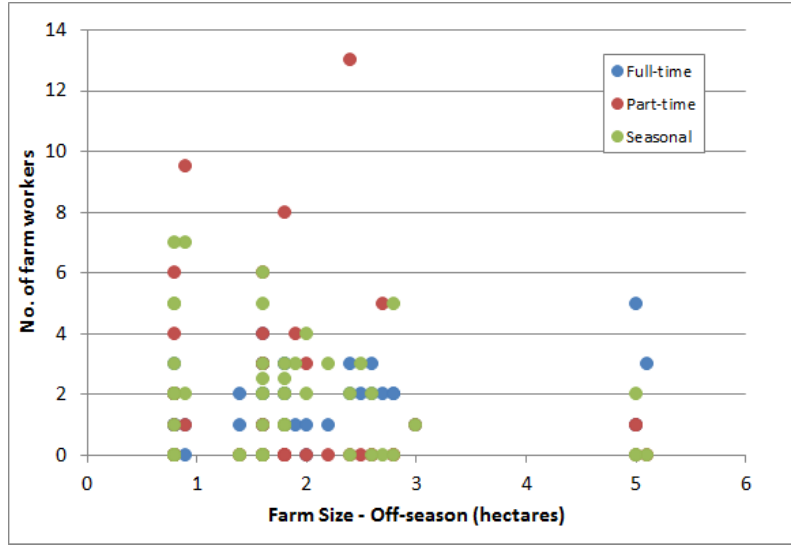


Figure 5.21: Scatterplot of farm size against number of farm workers employed during the off-season

Figures 5.20 and 5.21 show a graphical representation of hiring patterns for the main season and off-season respectively. Both diagrams show the full-time labour force exhibiting a positive relationship with the number of farm workers, whereas the part-time and seasonal workforce shows a negative relationship. The correlations, given in Table 5.6 indicate stronger relationships during the off-season.

The results may indicate a more structured approach to hiring full-time workers but a more ad-hoc approach to hiring temporary workers, particularly in the smaller farms with less financial input. As mentioned earlier, the degree of mechanisation may also impact on the number of workers. Again, the stronger negative correlations during the off-season may indicate a much looser approach towards hiring and firing of the temporary workers with little forward planning involved.

Seasonal Expenses

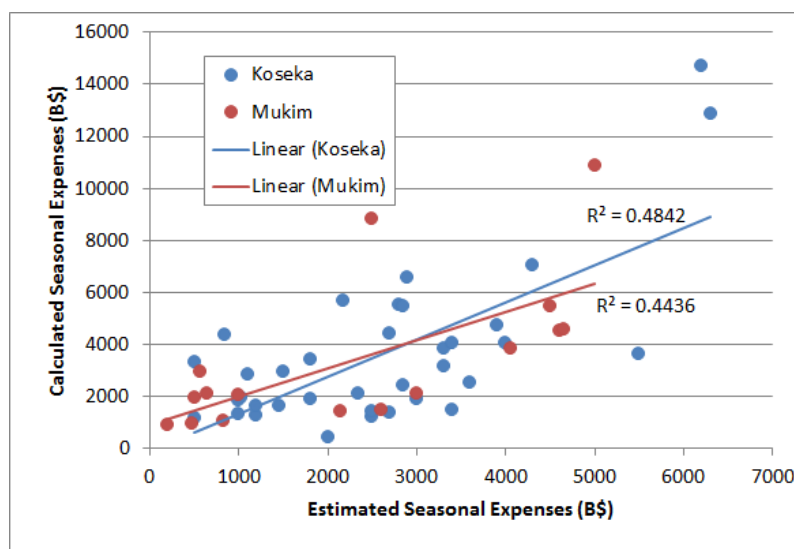


Figure 5.22: Scatter plot of estimated against calculated seasonal expenses

Aside from the number of workers and farm sizes which are varied across the Koseka and Mukim farm plots, there are factors that are more predictable as it directly impacts the cost of rice production. The costs of rice production (the sum of main season and off season expenditure) can be obtained from two sources; First, from the farmers' *estimated expenditure* obtained from the surveyor, and second, by the use of *calculated expenditure* of B\$1.60 per kg of harvested rice that is the price government pays for the unhusked rice. The estimated expenditure is an estimate given by the farmers themselves, while the calculated expenditure is derived with the use of the price set by the government in the buy-back scheme and is multiplied by the amount of production.

The comparisons for each farm can be seen in Figure 5.22. The distribution indicates a reasonably strong correlation between the two ($r^2=0.48$ and 0.44 for Koseka and Mukim farmers respectively) although the calculated expense generally exceeds the estimated cost with an average difference between the two of B\$1,055. This indicates that estimated expenses are approximately a constant fraction of the yield, and therefore possibly economies of scale are not valid for expenditure. If the estimated expenditure is considered to be the more accurate estimate than the calculated expenditure (because the farmers' probably have a closer knowledge of their spending) then it appears that the farmers are able to economize in their farming expenditure. This may have a bearing on their relatively low productivity.

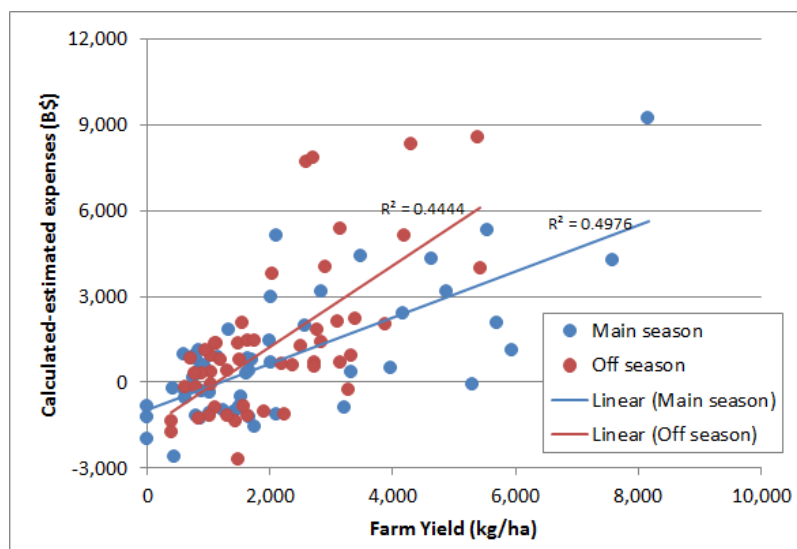


Figure 5.23: Scatter plot showing difference between calculated and estimated seasonal expenses and farm yield for main and off seasons

Statistical analysis was done to prove/disprove the possibility that farmers are able to economize their farming expenditure, and the result is represented in Figure 5.23. The cost savings of production (expressed as the difference between the calculated and estimated expenditures) is plotted against the yield per hectare for both the main season and off-season. The distribution of the data demonstrates that those farms with the highest yield per hectare have the largest difference between calculated and estimated expenditures. This indicates that if the difference in estimates is an expression of cost savings, then those cost savings are not impacting the yield.

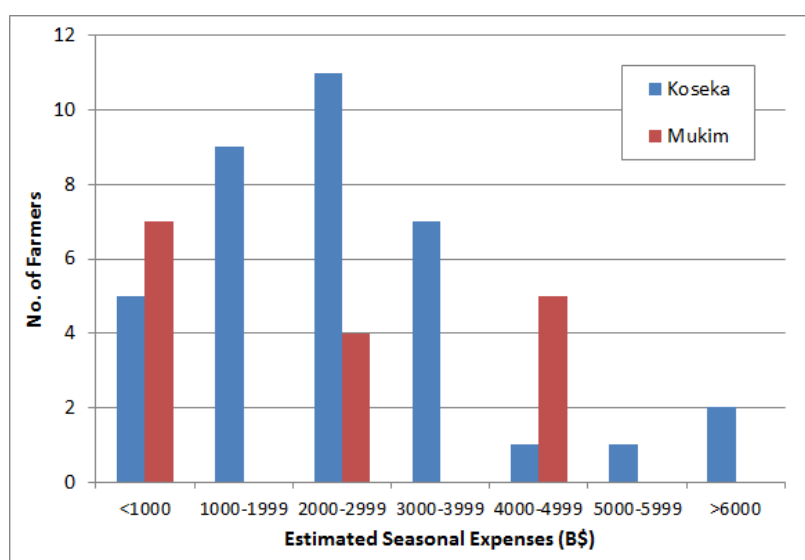


Figure 5.24: Distribution of estimated seasonal expenses

Furthermore, the farmers were asked for an estimate of their seasonal expenses as a combination of labour and other costs such as buying agricultural inputs (e.g. fertiliser) and rental on farm equipment. The labour expenses did not include the farmer themselves. Figure 5.24 shows the positively skewed distribution around the average expense of B\$2,513, indicating that most farmers have a relatively low amount of expenditure. Although a small number (three) have expenditure in excess of B\$5,000 per season due to farmers having big plots of land. There is no significant difference in the average estimated seasonal expenditure based upon ownership (Koseka against Mukim), ($p=0.29$).

Concurrently, two further hypotheses can be proposed. First, farmers who can make savings in expenditure also have sufficient knowledge to obtain improved production practices over those that are unable to make similar savings. This results in better practices of farming methods, leading to higher yield and productivity. In other words, high cost savings do not entail a low quality yield or low productivity. Another proposed hypothesis is that the estimated expenditure values are erroneous although the r^2 values are 0.50 for main season and 0.44 for off season), which could happen as farmers may have underestimated their expenses perhaps due to lack of knowledge and of formal accounts. This may result in expenses that were not included in the estimate, which leads to low estimated expenses, and high cost savings (differences between calculated and estimated expenditure). For the purpose of this research on profitability, the calculated expenditure will be considered as the more accurate and reliable of the two values as the calculation is done via the use of the rate in the buy-back scheme of B\$1.60 per kg of unhusked rice, and the amount of yield produced – less prone to human error and estimates.

Main- and Off-season Income

The profitability for both main and off-seasons, calculated from the difference between the seasonal income and the calculated seasonal expenditures, is expressed in Brunei dollars per hectare. The correlation between the two seasons is weak ($r=0.34$) demonstrating that there is little relationship between the two and the farmers' profitability for one season is not necessarily a good indicator of profitability in the other. This is a significant finding because it calls for year-round effort in order to sustain productivity, which leads to productivity in both seasons.

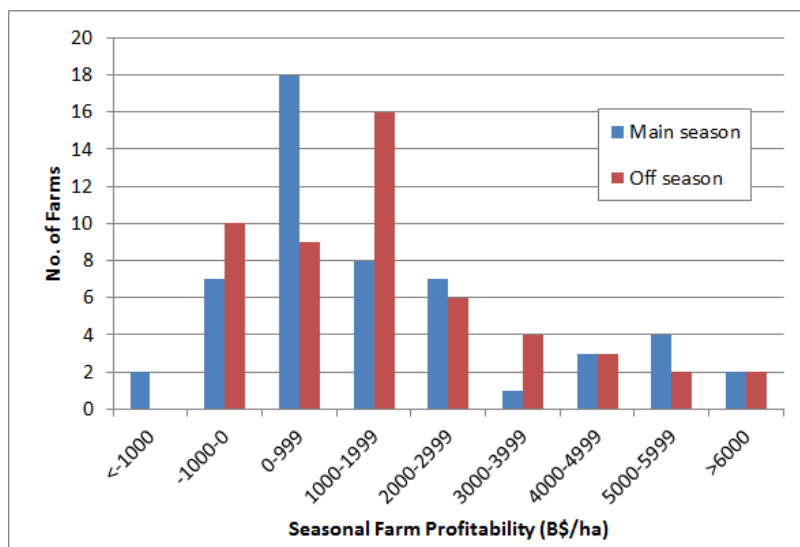


Figure 5.25: Distribution of farm profit

The distribution of profit seen in Figure 5.25 is generally positively skewed for both seasons. The average farm profitability for both seasons are similar (B\$1,786 per hectare for the main season and B\$1,783 per hectare for the off season) and there is no statistically significant difference in the means based upon ownership by Koseka or Mukim ($p=0.26$). This is a significant indicator that rice farming is a viable source of income even when the farmers only sell to the government via the buy-back scheme as there is generally a likelihood of attaining income and profit, regardless of whether it is in the main- or the off-season, and whether the rice that is being planted is the *Laila* or the *Titih* variety.

The distribution of overall profit between the seasons is broadly similar between the two groups of farmers, with some differences between the seasons although they have similar mean values. The overall results portrays an array of farmers having individual, distinctive traits in their farming practices that reject simple grouping and thus, a classification that enables characteristic behaviour to be identified is difficult.

Indication for the income from the rice production, as was previously discussed, will be taken from the calculated expenditure which is an estimate derived from the price set by the government of B\$1.60 per kilogram of unhusked rice, and the amount of yield produced and sold. These was gauged to be a viable estimate due to the concrete numbers that are considered for calculation. However, it should be noted in earlier discussions that

ome farmers do sell a substantial amount of their production to the open market. Since the open market offers better pricing, albeit having low capacity of purchase i.e. not able to buy as much as the government, this option will significantly add to the farmers' incomes.

The data for amount sold on the open market comes directly from the interviewees. For the purpose of analysis, the price used to produce an estimate of income is not the open-market price but the price given by the government (B\$1.60/kg of unhusked rice). This is because previous analysis has also shown that despite resistance of selling to the government for various reasons in the buy-back scheme, income can still be attained by farmers. In addition, the variation of price offered per kilogram of unhusked rice is too great in the open market that it may not be a viable option for income calculation. The annual farm income was calculated from the total income from both seasons sold into the purchasing scheme and into the open market and divided by the average area of farmland used over both seasons.

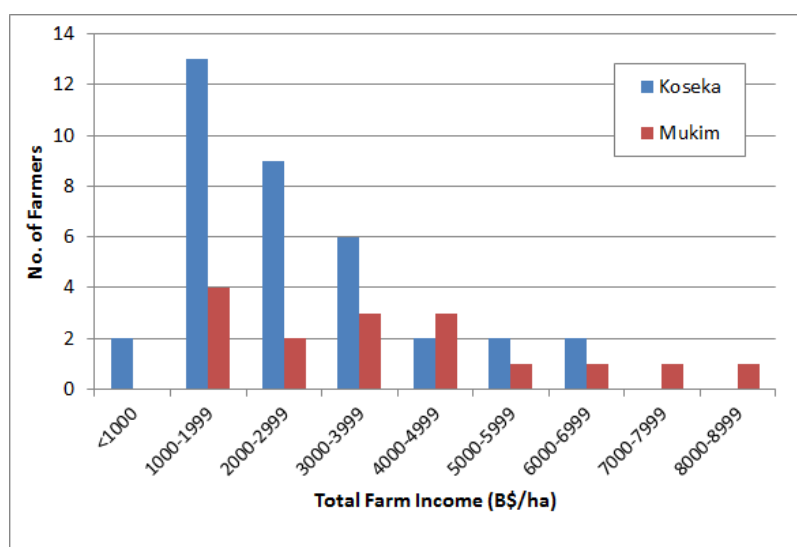


Figure 5.26 Distribution of total annual farm income

The distribution of the total annual income can be seen in Figure 5.26 which shows a large range of incomes, with a mean of B\$3,060 per hectare, a minimum of just under B\$500 per hectare and a maximum of B\$8,300 per hectare. The larger annual farm income

values indicate the potential for much greater productivity. This is consistent with previous analyses conducted whereby the better, and later best, farming practices skewed indicating that the majority of sampled farmers are still performing, and attaining profit, way below the potential productivity of their farms. In order to explore the path that leads to reaching the upper threshold of productivity in farms, it is worth investigating the characteristics of farmers that have already been gathered in the study.

Farmers' Demographic and Characteristics on Farm Productivity and Profitability

Table 5.7: Chi-squared test p-values for farmers' characteristics by yield and profitability measures

Characteristic	Yield (kg/ha)			Profitability (B\$/ha)		
	Main S'n	Off S'n	Total	Main S'n	Off S'n	Total
Group	0.28	0.89	0.51	0.15	0.00	0.36
Age	0.10	0.03	0.06	0.02	0.60	0.18
Education	0.48	0.91	0.76	0.73	0.73	0.94
Experience	0.20	0.02	0.11	0.38	0.04	0.54
Off-farm Income	0.69	0.86	0.47	0.91	0.63	0.34
Mechanisation	0.00	0.02	0.00	0.00	0.39	0.07
(planting)						
Mechanisation	0.06	0.12	0.21	0.02	0.76	0.19
(harvesting)						
Size Main Season	0.98	-	-	0.09	-	-
Size Off Season	-	0.00	-	-	0.73	-
Labour Full-time	0.08	0.23	0.04	0.27	0.00	0.18
Labour Part-time	0.23	0.52	0.73	0.62	0.09	0.05
Labour Total	0.05	0.01	0.03	0.28	0.02	0.05

The table shows the Matrix of p -values obtained from chi-squared testing of farmers' characteristics against measures of yield and profitability. Numbers in **bold** refers to p -values equal to or less than 0.05.

Source: Field data, 2010-2011.

Table 5.7 is a matrix of p -values of farmers' characteristics against various measures of total productivity and profitability and for both main- and off-seasons. Where $p \leq 0.05$, the values are **bold**. A number of characteristics have a significant impact on a number of

farm outputs. In general, the two characteristics with the largest impact on all measures of output are the number of labour employed, and the amount of mechanisation (in both planting and harvesting).

Table 5.8: Contingency table of level of mechanisation with farm yield

Observed Counts	<6,000	>6,000	Total
Fully Mechanized	14	16	30
Mixed	2	6	8
Fully Manual	13	1	14
Total	29	23	52
Expected Counts	<6,000	>6,000	Total
Fully Mechanized	16.73	13.27	30
Mixed	4.46	3.54	8
Fully Manual	7.81	6.19	14
Total	29	23	52

The tables show the observed and expected counts of farms with different amounts of mechanisation for planting against total yields of less than and greater than 6,000 kilograms per hectare.

Source: Field data, 2011

The contingency table for the impact of mechanisation of planting on total yield is given in Table 5.8. The observed values exhibit the number of farms with different amounts of mechanisation against whether the total yield for that farm is less than or greater than 6,000 kilograms. For example, there are a total of thirty farms that employ full mechanisation for their planting, with fourteen farms yielding less than 6,000 kilograms per hectare over the two seasons and sixteen that produce more than 6,000 kilograms per hectare. The expected values show the count of farms if the null hypothesis (that mechanisation of planting is independent of yield) is true. Similar values for observed and expected values for each cell indicates the null hypothesis being supported whereas large differences suggest that the null hypothesis should be rejected.

The example in Table 5.8 shows the largest difference between observed and expected

values being for fully manual planting where the observed number of farms with yields of less than 6,000 kilograms (thirteen farms) is much greater than expected if there was no impact (eight farms). The p -value from Table 5.8 of 0.00 indicates that this difference is significant and therefore farms with full manual planting have significantly smaller yields. From Table 5.8 it can be seen that the degree of mechanisation of planting on yield is significant for both main and off-season yields although it is only significant in terms of profitability on the main season.

The other characteristic that has a similar large impact is the size of the workforce which was calculated as the total number of labourers used on the farm, irrespective of them being full-time, part-time or seasonal. The difference between observed and expected values is significant for all measures of yield and profitability with the exception of main season profitability. The picture that emerges concerning labour is that those who use fewer labourers have significantly less yields and profitability. Thus it appears that those farms who invest more in mechanisation and labour will likely become more profitable than those who fail to invest significantly.

A summary of the findings from the chi-squared analysis can be seen in Table 5.9 where the summary of the significant impacts of each of the characteristics on the different measures of productivity and profitability are briefly described.

Table 5.9: Summary table of significant impacts of farmers' demographic and characteristic on measures of productivity and profitability

Demographic / Characteristic	Classes	Summary
Group	Koseka Mukim	During the off-season, more than expected (1) produce profits of less than B\$2,000/ha, and more than expected (2) produce profits of more than B\$2,000/ha.
Age	Less than 55- years 55-years and older	Farmers (1) have significantly lower off season productivity and main season profitability than their (2) counterpart.
Education	Primary and lower Secondary and higher	Education does not have a significant impact on productivity and profitability.

Experience	Less than 12 years 12 years and more	Farmers (2) have significantly lower off season productivity and profitability than farmers (1).
Off-farm Income	Less than B\$2,000 B\$2,000 and more	There is no significant impacts of off-farm incomes on farm productivity and profitability.
Mechanisation (planting)	Fully mechanized Mixed Fully manual	Mechanisation (planting) has significant impacts on productivity in main-, off- and both seasons as well as in the main season's profitability.
Mechanisation (harvesting)	Fully mechanized Mixed Fully manual	Mechanisation (harvesting) only has a significant impact on main season's profitability.
Size of Farm	Less than 1.5ha 1.5ha and more	This is a measure of economies of scale. There is a significant impact on productivity where (2) produce higher off season yields than (1).
Labour: Full - time	Less than two Two and more	In terms of labour, (2) produces significantly larger productivity and off season profitability than (1).
Labour: Others (part-time and seasonal)	Less than three Three and more	In terms of part time and seasonal labour, (2) produces higher total profitability than (1).
Labour: Total	Less than five Five and more	The employment of (2) significantly increases all measures of productivity as well as off-season and total profitability.

Table 5.9 demonstrates that there is a range of demographic and characteristics that impacts the productivity and profitability of farms. In terms of demographics, the Mukim farmers outperformed Koseka farmers despite the fact that there is no significant difference in the average non-farming incomes between the Koseka farmers (B\$3,325) and Mukim farmers (B\$1,562), ($p=0.07$), due to the very high variance of incomes. This supports the idea that farmer groups (either Koseka or Mukim) and the off-farm income does not have an impact on the productivity and profitability of the farm. Education was also found to be a non-contributing factor, perhaps because of the sole source of information and knowledge for farming comes from the DAA. However, in terms of age and experience, there are significant differences statistically observed. Farmers who are less than 55-years of age have lower off-season productivity and main season profitability than those who are older. In addition, experience of farmers who have less than 12 years of experience in farming have significantly higher off season productivity and profitability than those who have 12 or more years of experience. This could indicate that the older group of farmers, who have less farming-year experience, are given the

opportunity by the DAA to experiment with the hybrid variety *Titih* in their plots than their young but perhaps more experienced counterparts. This leads to the increased productivity and profitability. This correlation can be derived from previous discussions where it was found that the experimental variety of rice *Titih* is a high-yielding variant of rice that produces an average of 8 mt/ha compared to the *Laila* variant which yield an average of 3 mt/ha only.

In terms of characteristics, mechanisation for both planting and harvesting, the size of the farm, and labour employment all have a significant impact on the farm's productivity and profitability to a certain extent. For example, as demonstrated in Table 5.10, the reliance on mechanisation on planting has an impact on both productivity and profitability, while mechanisation on harvesting only has an impact on the profitability of farmers during the main season and not the off-season. As expected, bigger-sized farms satisfy the economies of scale better than smaller-sized farms, which impacts the productivity of rice especially during the off-season period. In terms of labour, more labour across all types (full-time, part-time and seasonal) has a significant impact on productivity and profitability of farms, in both main- and off-season.

Further analysis was done in the form of regression analysis and correlation matrix to identify the factors that influence rice productivity at the *Wasan* scheme.

Table 5.10: Summarised Ordinary Least Square (OLS) Regression Results

	Unstandardized Coefficients					Standardised Coefficients
		Std.				
	B	Error	t-stat	Sig.		Beta
		1790.36				
Constant	-3731.609	5	-2.084	0.043	*	-----
Age	-3.957	24.394	-0.162	0.872		-0.013
FSize	993.674	286.877	3.464	0.001	**	0.299
NW	391.053	158.402	2.469	0.017	*	0.287
VC	1.604	0.473	3.389	0.001	**	0.412
Exp	152.238	72.387	2.103	0.041	*	0.166
R-square.....		0.720		F-ratio.....		23.663
Adj. R-square.....		0.690		Sig.....		0.000
Durbin-Watson.....		2.316				
No. of Obs.....		52				

Source: Field data, 2010-2011

Note:

** and * indicate significance at 1% and 5% level of significance, respectively.
 FSize – Farm size, NW – Number of workers employed, VC – Variable cost, Exp – Years of farming experience

Table 5. 11: Summarised Stepwise Multiple Regressions Results

	Unstandardized Coefficients					Standardised Coefficients
	B	Std. Error	t-stat	Sig.		Beta
Constant	-3972.091	993.114	-4.000	0.000	**	-----
FSize	996.621	283.319	3.518	0.001	**	0.300
NW	393.092	156.259	2.516	0.015	*	0.288
VC	1.593	0.463	3.440	0.001	**	0.409
Exp	153.617	71.259	2.159	0.036	*	0.167
R-square.....	0.720			F-ratio.....		30.197
Adj. R-square.....	0.696			Sig.....		0.000
Durbin-Watson.....	2.321					
No. of Obs.....	52					

Source: Field data, 2010-2011

Note:

** and * indicate significance at 1% and 5% level of significance, respectively.

FSize – Farm size, NW – Number of workers employed, VC – Variable cost, Exp – Years of farming experience

From Table 5.11, it is found that farm size (FSize), number of workers (NW), variable cost (VC) and experience (Exp) have statistically significant effects on farmers' yield at 5 percent level or better. Specifically, the coefficient value on FSize implies that, controlling for the effects of the other predictor variables, farmers yield per hectare increases by approximately 993 kg for an increase in farm size by one hectare. Similarly, significant NW, VC and Exp coefficients imply that the yield of a farmer increases by 391.053, 1.064 and 152.238 kg for each unit of increase in the number of workers, variable cost and years of experience respectively. The standardized coefficients indicate that one standard deviation change in VC has the highest effect on farmers' yield followed by FSize, NW and Exp. Finally, the results suggest that the predictor variables together explain 69% percent of the variance in farmers' yield (adjusted R-square), the significance of which is confirmed by the overall test of the goodness of model fit ($F=23.663$, $p<0.001$).

Although the results in Table 5.10 show that the model is a good fit for the dataset, only four predictor variables out of five appear to have a significant influence on yield.

Therefore, to obtain a more parsimonious presentation of the model of farmers' yield, a stepwise multiple regression analysis is carried out. The results of this are presented in Table 5.11. Consistent with the unrestricted model, it is found that Farm size (FSize), number of workers (NW), variable costs (VC) and years of farming experience (Exp) retain their significance in explaining farmers' yield with NW and Exp improving in their significance level. It is observed that the parsimonious model shows some marginal improvement in the model fit in terms of adjusted R-square (69.00 vs 69.60 percent). Also, it is established that, consistent with earlier results, a unit standard deviation change in VC has the highest effect on farmers' yield.

This correlation matrix shows the strength and direction of linear pairwise relationship between the variables under consideration.

Table 5.12: Pearson's Correlation Matrix

	Yield	Age	FSize	NW	VC	Exp
Yield	1 ----					
Age	0.018 (0.899)	1 ----				
FSize	0.577** (0.000)	-0.015 (0.917)	1 ----			
NW	0.698** (0.000)	0.028 (0.843)	0.344* (0.013)	1 ----		
VC	0.759** (0.000)	0.109 (0.442)	0.421** (0.002)	0.738** (0.000)	1 ----	
Exp	0.211 (0.133)	-0.106 (0.454)	0.031 (0.825)	0.025 (0.861)	0.066 (0.640)	1 ----

Source: Field data, 2010-2011

Note: (i) ** and * indicate statistical significance at 1% and 5% level, respectively.

- (ii) Age, FSize, NW, VC and Exp are the age of farmers, farm size, and the number of workers, variable cost and number of years of experience respectively.
- (iii) Yield is a measure (or proxy) of productivity.

Notably, the correlation coefficients between the dependent variable (yield), which is a proxy for productivity, and each of the five predictor variables have expected sign and

are all (except age) significant at 5% level or better. The correlation matrix also facilitates an examination of the sample correlations between predictor variables to detect the possible multi-collinearity problem. It is problematic to identify the effects of predictors if the predictor variables are perfectly or highly correlated with correlation coefficient being close to one.

Table 5.13: Multicollinearity Diagnostics

	Age	FSize	NW	VC	Exp
Tolerance	0.965	0.817	0.451	0.412	0.981
VIF	1.037	1.224	2.220	2.428	1.020

Source: Field data, 2010-2011

To further allay fears of the multicollinearity issue, the variance inflation factor (VIF) and its reciprocal known as the tolerance are computed for each of the independent variables. These values are reported in Table 5.13. It is found that VIF values range between a minimum of 1.020 (a maximum tolerance of 0.981) for experience (Exp) and a maximum of 2.428 (a minimum tolerance of 0.412) for variable cost (VC). Therefore, judging by the popular rule of thumb of a maximum acceptable VIF of 10 (a minimum acceptable tolerance of 0.10), none of our predictor variables seems to pose any serious threat of multicollinearity to subsequent regression analysis.

5.6 Issues Faced by Farmers

As part of the study, an assessment was made of the challenges faced by farmers at *Wasan* Scheme in order to examine the effectiveness of *Wasan* Scheme. This is crucial in understanding the issues faced by farmers at the ground level so that they can be succinctly addressed in order to improve the Scheme and increase the likelihood of further participation of farmers. This is to address research question 3.

Table 5.14: Issues Faced by Farmers

Problems	Responses	
	N	Percent
Insufficient water	38	33.0

Disease and pest	29	25.2
Poor drainage	16	13.9
Lack of infrastructure & technical support	16	13.9
Unreliable supplies of subsidized inputs	11	9.6
Delayed payment	5	4.3
Total	115	100.0

The table gives a summary of the problems faced across the farming groups. N refers to the number of responses. The percentages are calculated based on the total number of responses.

Source: Field data, 2010-2011

Table 5.14 outlines the major problems faced by farmers in both Koseka and Mukim groups in order to decreasing number of reports. Only one farmer did not provide the information regarding issues that he faces. The total number of responses is 115. 38 farmers comprising 33% of the total number of respondents do not get sufficient water for their farming activities. The next most common problem is disease and pest, which make up 25.2% of all problems, followed by poor drainage (13.9%) and lack of infrastructure and technical support (13.39%). The others are unreliable supplies of subsidized inputs (9.6%) and late payment by the government for farm produce (4.3%).

Table 5.15: Problems face by farmers by Knowledge Level

Source: Field data, 2010-2011

It is also important to gauge the levels of knowledge of the farmers in order to assess the quality of the reported issues faced. Table 5.15 shows the bar charts for problems faced in relation to the knowledge level of the farmers. The figure thus shows the percentages of total respondents facing specific problems. The observed trend is that those who claim to have high level of knowledge in rice farming are also the same farmers who claimed to have faced the majority of the listed farming problems. In other words, the experience that the farmers have informs the perceived needs and challenges listed in their responses. For instance, 55.3% of those who reported that there is insufficient water have high knowledge of rice planting. Again, 58.6% of those who complained of diseases and pests also claimed to have high knowledge of rice planting. The only exception is when there are unreliable supplies of subsidized inputs, where those with medium knowledge from

the majority of reports (54.5%). The possible explanation for this observation is that the farmers with a high level of knowledge are able to articulate the problems better and, therefore, can identify more issues, perceived or current, associated with rice farming.

Further analysis is carried out between the farming groups of Koseka and Mukim in order to get a more detailed insight into the nature of responses provided. The cross tabulations are displayed in Table 5.14 where the percentages are based on the farmers from the group who face the problems.

Table 5.16: Percentage of Farming Group Facing Problems

Problems	Group	
	Koseka	Mukim
Insufficient water	28.9%	43.7%
Poor Drainage	13.3%	15.6%
Diseases and Pests	27.7%	18.8%
Delayed payment	4.8%	3.1%
Unreliable supplies of subsidized inputs	13.3%	0.0%
Lack of infrastructure & technical support	12.0%	18.8%

The table shows the percentages of farming group facing various problems. Percentages are based on the farmers from the group who face the under consideration.

Source: Field data, 2010-2011

Most of those facing the various problems are farmers from Koseka since they form a greater proportion of the sample. Examination of these results on groups basis indicate that the top problem facing Koseka farmers is insufficient water (28.9%), followed by diseases and pests (27.7%). The others are poor drainage (13.3%), unreliable supplies of subsidized inputs (13.3%), lack of infrastructure and technical support (12%) and late payment from the government (4.8%). The Mukim farmers follow a slightly different trend where 43.7% of all problems are attributed to insufficient water. Infrastructure and technical support, as well as diseases and pest, have equal shares, (i.e. 18.8% each of their problem). This is followed by poor drainage (15.6%) and delayed payment (3.1%). These varying and somewhat overlapping trends between the Koseka and Mukim farmers enables the assumption that both farmers have only a slight variation in their farming practices and needs.

Rice farmers across both groups of farmers consider plot size and poor soil conditions as

the main hindrances to a productive rice farming practice in the *Wasan* Scheme. They reported that the soil is not fertile for farming due to the excessive use of fertilisers and other chemicals on the land. Those farmers who do not have enough capital to invest in improving the soil quality often produce low yield because they do not apply enough fertilisers to the farm land. Even with the application of the fertiliser, the yield is not much better because the land is full of acid and has low nutrients. One of the farmers commented that *“the problem of poor soil condition is compounded for those of us who farm on the peaty soil. It makes farming difficult because the land is waterlogged”*. The soil quality is considered a serious hindrance to rice farming activities. This seems to be an important issue to be addressed for the success of the *Wasan* scheme whereby specific attention has to be paid to the quality of land that is entrusted to local farmers for production of rice.

Another farmer also noted that *“the problems we face in rice farming are insufficient water supply, from where it was divided between Koseka and Mukim, even days for Koseka and odd days for Mukim, flooding, unavailability of subsidized items from the Agricultural Department, which force the farmers to buy those items from outside at higher prices. Diseases, pests and lack of machinery are also major problems”*.

A sixty-three old farmer said, *“pests is one of the major problems we face here. All sorts of pests including rats, birds and rice bugs do much damage to our crops before and after harvest. Furthermore, we face problems of rice diseases such as blast / panicle neck rot which caused rice to have empty seeds”*.

Another farmer listed the major problems faced which includes, *“cost of rice farming, water drainage caused by improper water system and infrastructure, unavailability and cost of subsidized farm items, inadequate supply of machinery and the government late payment of farmers.”*

These extracts supported the quantitative results in Table 5.14 and 5.16. These responses clearly compromise the ability to develop a successful farming initiative in the *Wasan* scheme, and could also lead to the demotivation of farmers in pursuing the rice-farming industry. It should be noted that the responses not only revolve around natural hindrances such as flooding, poor and peaty soil, and pests and diseases. There are also reports that specifically point to the inefficiency of the Scheme in the provision of adequate support to farmers such as the lack of infrastructure to supply water, the unavailability of

subsidized items and machineries, and the late payment from the government sector for purchased produce.

Figure 5.27 shows the general infrastructural support provided in Wasan.

Shortage of labourers are also identified as factors decreasing the productivity of rice farmers of the Wasan Scheme. Most of the rice farmers depended on labourers from Indonesia. They reported that they constantly faced challenges of a labour shortage. One of the farmers said,

“We mostly ask our family members to give us helping hands whenever we need their help. However, their support is usually not enough. This makes it compulsory for us to depend on the labourers from Indonesia. The problem with hired labourers is that there is no labour quota for rice farmers. Therefore, farmers have to use domestic maid quota. This creates a problem on its own as the rice farmers/employers fear that the Immigration Department may take action. Moreover, with the family members, most of them do not want to work in the rice fields these days. They prefer government jobs to the rice fields”.

The extract demonstrates that there is a paradox in the government’s system for the rice farming industry. The immigration policy, as stated in the extract, does not even have a labour quota for rice farmers and this calls for a desperate measure of using domestic aid quota to fill the labour workforce in rice farms. This is indeed a problematic solution as it will end up creating more problems than it would solve, particularly from the immigration department.

Another cluster of issues reported is associated with non-adaptation of modern technologies and proper infrastructure. The rice farmers reported that they were unable to adapt to the modern technologies and methods of farming, and as a result, they were unable to do farming effectively. Several deterrents were identified from qualitative approaches including the lack of propagation and application of higher yield varieties of *Laila* among the rice farmers community. In terms of proper infrastructure for water supplies, which includes irrigation and drainage, some respondents commented that they had to construct their own drainage and channel them to roadside drains, rivers and reservoirs. One respondent made this point,

“these days when it rains, all the water runs into the dug-out trenches, leaving the rice

fields to dry up. There is no proper construction of irrigation and drainage. Most of the irrigation comprise of dug-out trench which doubles up as the drainage system. What we learnt from the Rice Farmers Field School is not applicable to most of us. What we have learnt in theory is totally different from the way we apply it practically here. In theory, it is stated there should be 2 flows, 1 for inflow of clean water and the other for outflow. But in Wasan the same trench is used for irrigation and drainage. The drainage/irrigation benefits only those whose farms are closed to the irrigation. What is most annoying is that they channel the water into their farms leaving those of us who are far from the drain to suffer.”

Farmer No. 3.

Earlier discussions revealed that farmers from the *Wasan* scheme have limited years of experience in rice cultivation, and many obtain their knowledge from the DAA. However, the qualitative data shows that the applicability of the knowledge disseminated from the DAA is not applicable at times to the farmers who receive compromised subsidies, and infrastructure.

The drainage and irrigation problems encountered by farmers at the *Wasan* Scheme are epitomised in Figure 5.28.

Figure 5.28: Irrigation problem in Mukim and Koseka plots

Some of these problems are solved by farmers themselves, but the extent of addressing them depends strongly on the capital available for farmers. Some rice farmers are able to purchase generators to pump water. Those who cannot afford generators and pumps have to rely on the water/irrigation provided by DAA or annual rainfall. One farmer said: “*Most of us cannot afford to construct our own irrigation channels or buy the water pumping machines to supply water to our farms*”. Rice farming requires copious amount of water, and this is extremely challenging to fulfil during the dry season.

The problems faced by farmers occur in at least four-folds in the *Wasan* scheme. First, natural deterrents such as peaty and poor soil quality that was provided to rice farmers in the scheme, pests and diseases which to some extent may be difficult to eliminate in its entirety. Second, human resource deterrents which include the lack of enthusiasm and interest on the part of locals in seeking employment in the farming industry, and the absence of quota for labour hiring that forces the farmers to employ workers using the domestic aid quota from the immigration department. Third, infrastructure and subsidies

which are half-heartedly supplied to the farmers in the *Wasan* scheme. Fourth, the unavailability of financial assistance provided by commercial banks is also a significant problem. This calls for a more rigorous approach on the part of the government in ensuring that the deterrence in the *Wasan* scheme does not get out of control and compromise the potential of the farming industry.

The discussion section has so far presented a range of fundamental perspectives that are relevant to the current study. These include the descriptive analysis of the farmers' relevant demographic information, an overview of the farmers' farm inputs and yields, a range of analyses to gauge farmers' productivity and profitability, and finally an overview of issues that are faced by farmers. Prior to presenting further discussions, the first three research questions posed at the beginning of this chapter are addressed.

As such, through the quantitative discussion of my findings, it is obvious that the farmers have achieved limited success in rice cultivation because of several challenges posed—at a macro and micro level—to them. They further struggles to produce unrealistically high target annual yields exacerbated by the predominant rentier state pattern in Brunei. In my next chapter, I conclude by highlighting the way the rentier state thesis supports an evaluation of the limited efficacy of the *Wasan* scheme to meet the goals of economic diversification and food security. Given the farmers' demographic information provided here, it is clear that the protection of local jobs for a distinctive group of locals attests to Brunei's welfare system. Yet, this benefit comes at the expense of Brunei's needs of economic diversification and food self-sufficiency in rice cultivation. And so, my conclusion will reiterate all my current findings here whilst engaging relevant theoretical framework to sum up answers to my research questions.

CHAPTER 6

Key Findings, Conclusions and Recommendations

6.1.Introduction

This chapter presents the key findings, and recommendations of the study. It is divided into five sections. The summary of the problem and the purpose of the study are presented in sections 6.1 and 6.2 respectively. As such, I have drawn on relevant theoretical discussions—most lucidly the rentier state problem—to answer my first three research questions, that being the primary goals, rate of success and factors for the limited productivity of the *Wasan* Scheme. That said, I present my study findings that encapsulate the challenges of the country to meet its high target of a yield of three metric tonnes per hectare per seson (section 6.3). Amongst these are challenges related to the design of the scheme’s infrastructure, farm management, threats posed by pests and diseases; unsuitable farm machineries; ‘buy back’ payment process of government and non-existent quota for imported foreign workers (section 6.4). Ultimately, the priority placed on local job protection for a select group of the society by a “caring monarch” seems to take precedence over the goals of economic diversification and food security. These findings are presented in relation to both theory and policy—the practical implementation for improvement and implication for theoretical analysts and policy makers. Since attempts at economic diversification have received limited success in the *Wasan* Scheme, consequences of the study are espoused and recommendations are provided (section 6.5). To this end, future research directions are identified.

6.1.The Problem

For the past fifty years, Brunei has attempted to diversify its economy away from its heavy reliance on oil and gas that contributed to over 90% of its revenues (BND\$17,778 in 2015 at current prices, DEPD, 2016). Diversification into non-oil sector is seen necessary to shield the country from the negative effects associated with reliance on a single commodity (e.g. Cordon & Neary, 1982). One of the sectors that the country is focusing on is agriculture and has been adopted in the country’s five-year national

development plans since the beginning (first national development plans covering the period from 1953 to 1958) and has since contributed only 1% to the country's GDP in 2012 (DEPD, 2015). Agriculture is seen as a way forward due to the country's heavy reliance on food import resulting in the country to spent BND\$4,556.10 million on annual import for major perishable food commodities (food and live animals) in 2014 (DEPD, 2015). The impetus for diversification into agriculture is further intensified following the global food crisis that occurred in 2007/2008. Surge in food prices including rice, the main staple food of Brunei is seen as quite precarious to the economic advancement of the country since a substantial amount of the budget is devoted to importation of rice with domestic production of about 4% (Department of Agriculture, 2014). The government, realizing the danger this poses to the economic development of the country has, therefore, placed significant inputs to increase rice production and has revitalized the *Wasan* Scheme as part of its efforts to revitalize rice cultivation.

However, the *Wasan* Scheme has met with limited success in spite of the government's fervent call and accompanying policies to diversify the economy away from the oil and natural gas industry. Amongst others, based on my interview results and regression analyses, I show that there are fundamental contradictions that have worked against the success of rice cultivation in Brunei. Amongst these, a competitive and efficient rice growing system in Brunei would seem to require very large commercial farms, run by highly trained farmers, and make use of a combination of heavy mechanisation and large input of foreign labour. However, the government is promoting a system wherein retired military personnel, with no farming experience, are given small plots of land (and banned from starting large farms), whilst hampered by law from importing foreign workers. From a self-sufficiency standpoint, the cause for diversification through rice cultivation is not helped by an overarching emphasis to protect local job opportunities (especially for a select group of citizens). This is a classic manifestation of the problems of rentier state political economy. The paradox, exhibited also by GCC states, lies in the fact that agricultural development, and economic diversification broadly, are theoretically designed to move the economy away from oil-export dependence, but has ended up creating a new channel to distribute oil wealth to various groups of local people.

6.2. The purpose of the study

The aim of the research is to study the *Wasan* Scheme with regard to Brunei's self-sufficiency goal in rice production as part of the country's diversification strategy. It examines the scheme's design, farm and farmer characteristics, yield and issues faced by farmers, as well as the cost and possible benefits, both direct and indirect, to the economy. The conceptual framework developed in Chapter 1 (Figure 1.3) will be used to highlight the success and failures of the diversification based on a case study of wet rice agriculture (*Wasan* Scheme). The research questions examined in this study have been:

- a) What are the primary goals of the *Wasan* wet rice agricultural project?
- b) How successful has the *Wasan wet rice agricultural* project been at achieving each of its stated (or implicit) goals?
- c) What factors explain the success or failure at achieving these various goals?
- d) How does this inform our understanding of development in raw material export dependent economies more generally?
- e) What policy recommendations can be made on the basis of these findings?

In looking to examine the above research questions, I have identified three basic logics (Chapter 2) useful for structuring my analysis of the *Wasan* scheme. Firstly, I identified the logic of economic diversification, defined from the standpoint of economic efficiency. Secondly, there is also the logic of food security. Finally, there is the logic of rentier state patronage distribution, particularly with respect to employment generation for locals (e.g. ex-military personnel). My study shows that Brunei's rice agricultural programs are formally framed in terms of the first two, economic diversification and food security objectives, but in practice (by design or accident) are almost entirely oriented towards the last one, of rentier state patronage (particularly creating employment for retired military personnel). Other key findings show that the rice agricultural programs is seen to be a way of promoting rural development.

6.3. Findings related to my research questions

Research Question 1 concerns the primary goals of the *Wasan* scheme, which primarily revolves around economic diversification and food security/self-sufficiency in rice

production. Many of the farmers under study are performing well-under the potential of the plot of land entrusted to them, and hence producing yields below the target threshold and earning incomes that are only a fraction of the possible profitability. Issues faced by farmers that hampers the progression of the majority of the farmers under study should be addressed so that economic diversification is not too far-fetched. This will in turn reduce the heavy reliance on oil and natural gas as a sole source of that drives the economy. Concurrently, the success of the *Wasan* scheme will also improve the state of food security/self-sufficiency as the staple food of the nation through the production using high-yielding rice variety, *Laila* and unofficially, *Titih*. As of the current state of affairs, the production is only slightly above 3% of self-sufficiency, while the target threshold is 20%. An economically viable industry is foreseeable from the current study that can be reached with the success of the Scheme, with heavy involvement of local employment seekers, which will also reduce the rate of unemployment in the nation, increase personal income of both the Mukim and Koseka farmers, and spread all-round wealth (especially through donations to the poor and needy in the community).

Research Question 2 concerns whether or not the Scheme has reached its set goals. From the current study, the *Wasan* scheme is successful to a certain extent. There are many measures which was considered in gauging the success. The first measure is the level of economic diversification. This measure is satisfied to a certain extent through the flexibility and initiative shown by farmers in resorting to the open market to sell their produce and not depend on the government's buy-back scheme, and the involvement of unofficial suppliers for agricultural needs instead of relying solely on government subsidies and subsidized supplies. The second measure is the creation of an economically viable state. This was also deemed a partial success, especially in the individual and community level. Farmers are able to attain profit from their farming practices and share their wealth with the community, especially those who are in need or are poor, or even to other family members, and self-consumption. The third measure is the improvement of food security/self-sufficiency in staple food. The *Wasan* scheme has failed to satisfy this measure especially due to the fact that most of the farmers under study are unable to reach the maximum potential productivity in their respective plots. Therefore, collectively, the output of the *Wasan* scheme is well below the threshold for food security/self-sufficiency set as the national target. The fourth measure is addressing the unemployment issues in

the nation state. This is also a measure that is left unsatisfied by the *Wasan* scheme as the labour market in the farming industry is still dominated by foreign workers. This was due to the inability of the industry to compete with other lucrative options offered by non-agriculture industry.

Research Question 3 concerns factors that affect the achievement of the *Wasan* wet-rice farming initiative. The data source to respond to this research question is gathered from both secondary and primary data. From secondary data report, achievement of the Scheme is affected by a range of factors including natural conditions such as weather, and area of land suited for rice farming, and also man-made attributes such as yields produced by farmers. There is an overlap in the findings between the secondary and primary data in the study whereby both agreed that the yields by farmers can either contribute or compromise the achievement of the *Wasan* scheme. The primary data informs the current study by proposing that the overall design of the *Wasan* Scheme plays a vital role in the success or failure of the initiative. The design includes water supply, drainage and irrigation systems, infrastructure and technical support, supplies of subsidized inputs, payment by the government and sustainability of labour force.

Research Question 4 concerns the issues of the feeding of knowledge into understanding the development in raw material export-dependent economies. In the light of the listed factors listed in research question 3, the feeding of information on the development in raw material export-dependent economies occurs in two ways. First, in the recommended practice of good governance. Such practice not only promotes the achievement of a feasible outcome, but is also adept in providing the necessary tools to achieve it. Second, in the reduction of bureaucratic deterrence. A sustained labour force is very vital in the industry that has the potential in promoting economic diversification, food security and unemployment reduction. Bureaucratic deterrence compromises productivity, income and profitability of the farmers involved in the proposed initiatives, and should be addressed promptly and accordingly.

Next, the following section examines the ostensible goals of the *Wasan* project, using the three basic logics previously identified. In the light of my findings, I explain how each of these goals have either been successful or failed because of the predominance placed (either consciously or accidentally) on the rentier state economy in Brunei. Put simply,

because of the emphasis given to local job protection, the providence by the welfare state has come at the expense of economic efficiency and food security.

a) Goal of Economic Diversification

Economic diversification is essentially about expanding the national economic machinery to increase the variety of production activities, revenue streams and employment opportunities. From this perspective, the *Wasan* scheme at its present stage of development is unlikely to contribute to economic diversification, in spite of the various programmes and incentives provided by the government to farmers.

What is seen in the *Wasan* case study, the 97 hectares used by 52 farmers only managed to produce a combined harvest of 189,297 kilograms of rice with an average yield of 1,952 kilograms per hectare. This output does not contribute significantly to the country's GNP even in the case of when the outputs of all the wet rice fields of the country are put together the contribution to GNP is still insignificant. In spite of the presence of government subsidies *Laila* rice variety failed to meet the demand for local consumption, let alone for export. This is problematic given that the government of Brunei is operating on a system of subsidies on many food items, including rice. Thus, any sharp increase in the global prices in rice will cause a significant impact on the government's budget. This is what happened in April 2008 when the price of rice suddenly spiked to slightly over US\$1,000 per metric tonne. For every metric tonne of imported rice purchased, the Brunei government has to pay B\$1,240 assuming that the conversion rate is B\$1.24 to US\$1. However, the Brunei government then sells the rice on subsidized prices with a market price of \$1.25 per kg on imported fragrant Thai rice (AAA).

It would seem, therefore, that rice production is not a good alternative strategy for diversifying the economy. This is made clear by one of the respondent of the study who says,

In the ASEAN regions, rice is not an economic crop but a political one, unlike in Australia and United States. Therefore rice farming here in our country is not profitable. Nowadays, it is cheaper to buy than to grow rice.

Respondent 1

Based on the conceptual framework developed in Figure 1.3 (Chapter 1), it is clear that good governance is important to drive economic diversification. Good governance here

refers to government systems and processes that are efficient and supportive of the local rice production.

The governance framework for economic diversification needs to be structured to provide positive environment for it to flourish. This is the role of executive drivers or leaders such as those in the Ministry of Primary Resources and Tourism (MPRT) and DAA at various levels; national and village levels. In particular the diversification framework at national (macro) level should include a number of strategies which should not only be focused on the specific needs of *Wasan* project implementation but a much bigger strategies which should include the development of the private sector, the best use of natural resources in terms of their exploitation; the broader international framework and the capacity of development institutions and human resources (OECD United Nations OSAA, 2011). The *Wasan* study points to a number of unfavourable conditions which contribute to the failure of diversification efforts in the past years, let alone the efforts put into the implementation of *Wasan* project.

- i. *Educational level, skills and knowledge of Wasan farmers* - The *Wasan* study revealed that farmers have lower levels of education. Out of a total of 52, sixteen farmers had up to primary schooling, thirty had secondary schooling and five had achieved technical or vocational education. The study also revealed that farmers have relatively little experience in farming. Even as little to low formal education does not necessarily translate into little experience in farming, in this case it seems that both may have contributed to the farmers' lack of performance in the rice fields. In any case, there is evidence clearly pointing to a lack of education in farming amongst the *Wasan* farmers. Because of this combined lack of education (in farming as well as formal) and their little experience in farming, the diversification efforts in rice cultivation have been hindered as the *Wasan* farmers are seemingly ill-equipped to produce good yields.
- ii. *Positive attitude towards working and/or living in town* - This suggests that the locals are eager towards living in the urban areas. That is why many are not interested in farming as this is associated with living in rural areas and have lower status. Herein lies the paradox; local people are averse to getting involved in farming, whilst the import of foreign workers is not allowed. Evidence from the *Wasan* Scheme showed that majority of the

workers are seasonal workers (ninety- seven) than full-time (eighty-six) or part-time (eighty-five) employed on these fifty-two farms. This attitude, in theory, promotes non-farm activities, but it is not strong enough to have the effect of promoting diversification through rice farming. Also, just as it is symptomatic of the rentier state problem, the government's strategy in promoting wet rice farming is so direct that farmers now depend too much on the support provided instead of strategizing the development of non-farming enterprises. Nevertheless, farmers are found selling rice at the local market, indicating activities associated with non-farming activities. However, there are only a few private sector enterprises created as a result of farming activities. They provide such services as hiring equipment/machines, transportation of rice product and utilisation of private milling.

- iii. *Existence of social networks facilitating diversification by reducing cost* -There is little existence of social networks in facilitating diversification to reduce costs. Because of this apparent lack of social capital—with no to few farmers cooperatives working together—the jobs are not streamlined nor carried out in an efficient manner. Each farmer is seen to do every kind of possible work from A to Z. In this light, some form of 'specialisation' can be created to enable farmers to share resources.
- iv. *Insufficient access to land and low land productivity, small farm size* - The positive correlation between farm size and output together with the other characteristics identified are essentially crucial if the productivity of farmers is to be increased in view of boosting rice output for the country. Evidence from the *Wasan* Scheme suggests that farm size of Koseka owned farms (2.0 hectares) is significantly larger than the farms owned by the Mukim farmers (1.2 hectares) based on t-test at $p=0.02$. Although Koseka farms are expected to produce higher yields (due to their slightly larger size), Mukim farmers reported higher profits of over B\$2,000/ha, while Koseka farmers generated less than B\$2,000/ha during the off-season. In theory, this finding should encourage diversification to thrive through the development of non-farm activities. Inadequacies in land conditions encourage farmers to leave farming in favour of non-farming activities. However, there are other intervening variables that lead to farmers staying within this activity. One motivation is that the *Wasan* scheme contributes to the goal of community livelihood.

The *Wasan* scheme is also aimed at achieving rural development and poverty reduction by creating an economically viable industry and redistribution of oil wealth. The contribution of *Wasan* to the achievement of this goal is also a question mark. The growth of SMEs and spill over industries especially those associated with rice products has been minimal in the *Wasan* case study. For this goal to be achieved the government should have a plan of the kinds of products than can be made out of rice and should invest on giving value add to the establishment of small industry related to rice products such as cereals, *wajid*, rice cake and wrappers made of rice (food packaging). Brunei has a high grade of glutinous rice variety which has the potential to be explored for development in these areas.

As such, a key finding of the case study is that the design of the *Wasan* Scheme is more of meeting the needs of rural development programme to improve the livelihood of selected groups of members of the society, rather than for the purpose of economic diversification. Furthermore, the income and productivity figures associated with the *Wasan* rice project are much too low for it to contribute to the economy. Moreover, the *Wasan* scheme is plagued with problems which require major adjustments if rice farming is to become a significant contributor to economic diversification.

b) Goal of Food Security/self-sufficiency in staple grains

Witnessing the negative effects of the global food crisis, particularly on countries that are highly dependent on food imports, Brunei, which is a major food importer, has prompted His Majesty to express his concern in 2008 as stated in Chapter 1. This led to the Ministry of Primary Resources and Tourism (MPRT) through the DAA revitalizing the fledgling sector as part of its economic diversification plan by putting in place an ambitious development plan of self-sufficiency in rice production. The rice production programme was aimed at increasing the country's rice production from 3.12 per cent (982.9 metric tonnes) in 2007 to 20 percent self-sufficiency (5,800 metric tonnes annually in 2010). A target of 60% self-sufficiency (18,000 metric tonnes annually) was also set to be achieved by 2015⁶ through a medium-term plan (DAAa, 2009; Hajah Aidah, 2011).

⁶ Previous target for local rice production was as follows: 7% for the year 2000; 3% or 1,300mt worth B\$1.18million by 2005; 3.12% in 2008; and 2.9% in 2009.

The analysis presented in the preceding chapter (Chapter Five) showed that both groups of farmers at *Wasan* case study, Koseka and Mukim managed to produce a yield of less than three metric tonnes per hectare of *Laila* rice which is less than 1% contribution to national output. *Laila* rice was grown for the first time at *Wasan* in 2009 in the hopes that the country's short-term national target of 20 percent self-sufficiency in rice production for the year 2010 would be achieved because this variety of rice was expected to produce high yield of six metric tonnes per hectare per year when the double cropping was adopted. But rice production has been below the set targets. The 7th National Development Plan Committee (1996 to 2000) reported that "in spite of the government various programmes and incentives to farmers, the country is still dependent substantially on imported rice as local production only accounted for about three per cent of the total requirements" and in 2014 the local production is only at 4.05% (Department of Agriculture, 2015). Brunei's goal towards self-sufficiency in rice production has not been met and it is expected that the goal will not be achieved in the future unless action taken to improve the current unfavourable situations (see Chapter 5). These include the declining trend in the number of rice farmers and areas under rice cultivation; too much reliance on part-time rice farmers; failure to encourage farmers to undertake large-scale rice plantation because of end-product subsidy, and inadequate commercialisation of the *Wasan* scheme.

c) Goal of Reducing Unemployment

Findings from the study revealed that the goal of government of reducing unemployment is clearly unattainable as only a small portion of the workforce in *Wasan* scheme is made up of locals. Jobs that are created at the *Wasan* rice project are limited as it is only opened to two small groups of the population, namely retired army personnel and members of a small local village community. Even if the jobs are open to the general public, it is expected that very few of them would be interested in the jobs because farming is seen as associated with the low-status, low-wage and uneducated strata of society.

Since the discovery of oil in 1929, oil wealth has established an economy that is supported almost entirely by hydrocarbon exports as well as a generous welfare system that has raised the standard of living of the nation's small population significantly. The government became the main employer of the locals, while foreign nationals make up the

majority of the private sector workforce. Traditional occupations like farming and fishing are regarded as backward, uneducated and therefore undesirable, compared with office jobs, even if the office job is merely that of a low-wage clerk or peon. To some extent, this is because the latter is carried out in modern urban facilities instead of village, farms, rivers or coastal seas. Graduates in the agricultural field tend to look for employment in the agricultural department of the government. Large farms are generally operated by descendants of migrants, which supplies the local market. Village farms tend to be subsistence in nature, and only supply the smaller local markets and roadside stalls. Agricultural exports are very limited and the entire sector contributes only about 4% of the GDP. Rice imports as well as rice cultivation schemes continue to be subsidized and managed by the government almost as part of the national welfare system, instead of an economic sector. This welfare system is ultimately characteristic of a rentier economy.

Associated with the government's goal to reduce unemployment is the attendant issue of increasing farmers' income. Hence, the objectives of wet rice farming are not only to reduce the dependence on imported food products and to increase local production per hectare of rice yields through the use of high-yielding varieties suitable to be planted in the country, but also to increase the farmers' income through increase in rice production and sales of rice yields.

This *Wasan* study reveals that the overall distribution of the main-season income across the groups ranges from \$560 to \$8,586.70. The mean income for the two groups are also different, that is \$2378 (std. dev. = 1408.3) and \$2602 (std.dev = 958.9) for Koseka and Mukim farmers respectively. This shows that Mukim farmers earn slightly more than the Koseka farmers. Off-season income across the groups ranges from \$465.71 to \$9,026.67 with an average of \$3,222 per hectare.

It seems that rice farmers are found to contribute indirectly to the economy. This is reflected in the alms they give out from the harvest from the farm. According to the Islamic doctrine, a farmer is supposed to give part of his/her harvest as alms either to the poor or the needy locals. This action is part of a religious act or belief. Although this activity involves them giving out, it is in a sense represents some non-pecuniary gain that accrues to them from the religious perspective. Such good deeds are considered to receive extensive rewards in the hereafter. It is therefore not surprising that in this study there is

a positive relationship between alms and yield of farmers. In addition to the alms, farmers sell their produce to the government, on the open market and use the rest for own-consumption. Thus, even as the *Wasan* scheme has failed to contribute to economic diversification and food self-sufficiency, it has contributed to the development of the rural community through farmers' socially responsible acts, such as extending food assistance to the poor through the giving of alms.

6.4.Factors contributing to low productivity

The failure of *Wasan* scheme to produce the output expected, according to the *Wasan* farmers, is because of numerous factors ranging from inadequate land size for rice cultivation and the poor soil condition because of acidity and low nutrients content to lack of machineries and improper drainage system. These factors are categorised into problems with the design of the *Wasan* Scheme; farm management; serious pests and diseases; farm equipment, and limited manpower.

a) Problems with the design of the *Wasan* scheme

Farmers at *Wasan* Scheme were also plagued with problems of having too much water during the rainy season. The difficulty here lies in terms of removing excess water from the rice fields as the open drainage is already flooded with water. This is especially so during the rainy season. During the rainy season, the water level in the channel would rise to a level higher than the fields. Being poorly maintained, the open drainage and irrigation canals would be overflowed with water. This is further compounded by the uneven rice plots, which eventually result in large areas of the farmland becoming water logged. The bearing capacity of the soil is weakened causing farm machinery to be stuck in the muddy patches. Another consequence of poor drainage is land toxicity caused by the accumulation of minerals from the water and by fertiliser residue. Plant growth is stunted and yields during harvests is low.

b) Problem with farm management

Farmers lack the necessary knowledge and skills on how to plant *Laila* rice which is a high yielding variety. For farmers who have the experience in rice planting, it was based on the traditional ways, which is different from how *Laila* variety should be treated. There

are courses offered to teach farmers on proper farm management but was taught by someone from the Philippines. Although their teaching was invaluable as a guide, it was based on Philippines' experience and lack the applicability to the situation in Brunei. This problem is further compounded by the lack of experience of local agricultural extension officers.

c) Occurrence of serious pests and diseases

Pests refer to the occurrence of insects such as rice bug (*“kekisang”*), snails, birds and rats while diseases refer to the different types of rice diseases. The most common are leaf folder. During the interview sessions, farmers revealed that they were faced with the problem of pests, and mainly attacks from birds and rats. If uncontrolled, they would produce lower yields. Birds will attack during the day while rats during night time. For the former, some farmers practise the use of “telinting” or aluminium cans that are being tied up on a rope like flags to prevent and keep away birds from attacking the paddy crop. This will have to be controlled manually and farmers have to stay vigilant especially during the early mornings around 8.30 am, and in the afternoon between 3.30 to 6.30 pm. However, for rats, farmers implemented several measures. This includes setting up black plastic fencing on the outside perimeter of the paddy field so that rats do not enter the rice field.

A major difficulty faced by most farmers is that they do not possess the relevant knowledge on how to deal with diseases, and even more so with pests. During the interview period, farmers highlighted a serious problem of pest infestation that comes from an insect known as brown leafhopper. This insect caused widespread problems as it left burnt-like effects on the leaves and causing up to 60% yield loss. In its early infestation, round, yellow patches appear, which soon turn brownish due to the drying up of the plants. This condition is called 'hopper burn'. Consequently, farmers have to seek advice from agricultural extension officer on how to deal with pests and diseases on their paddy fields.

The socio-economic status of the farmers also plays an important role in the cultivation practices of the rice farmers. Not all of the farmers interviewed were willing to spend more money on agricultural inputs such as insecticides, herbicides, fertilisers, and pesticides, unless of course these items were either unavailable or not being supplied by

the agricultural department. Furthermore, as farmers 2 and 4 state, the products—even if costly—sold in agricultural shops are perceived to be more effective in controlling pests and diseases than the one sold by the department. Both respondents spent between \$20 to more than \$100 to enhance their farm's productivity to an optimum level. This includes the eradication of weeds, use of suitable fertilisers, the systematic control of pests and diseases and the introduction of an integrated plant protection.

d) Farm Equipment

There is also an issue of renting out mechanical equipment such as transplanters and combine harvesters by the government. This was due to the limited availability and that some of these machineries were unsuited to work under wet conditions. This problem can be attributed to either the lack of efficiency in the renting process or an oversight by the government, who may need to pay attention to the purchase of suitable machineries. In any case, this government policy problem needs to be reviewed. This results in delays in every stage of the wet rice activities. Delays in harvesting the padi grain, for example, would entail the padi becoming too ripe and that the padi become eaten by birds to leave behind only empty husks. Consequently, farmers have no choice but to harvest manually - by hand. The rice crop is either cut by using three of the simple hand tools; (i) sickles cutting 15-25 cm above ground level, or (ii) hand-held knives to cut just below the panicle and/or (iii) grass cutter harvester. As a result of the manual system of harvesting, farmers were then faced with having to do the threshing separately which involve additional labour to collect the harvested crop and costs to pay for the threshing. Any delay between cutting and threshing causes rapid deterioration of the grains, especially during field drying or when the crop is stacked in the field. Poor threshing can also cause high threshing and scattering losses.

On the other hand, using the combine harvester⁷ rented from the DAA will save a lot of time and labour as everything is done in one go. However, the government policy related to renting combine harvesters from the DAA is problematic not only in terms of the limited numbers available, but that some of the machineries were unsuited to work in the

⁷ A "combine harvester" is a machine that "combines" several harvesting operation such as cutting, feeding into threshing mechanism, threshing, cleaning, and discharge of grain into a bulk wagon or directly into bags. Straw is usually discharged behind the combine in a windrow. (<http://www.knowledgebank.irri.org/ericeproduction/whnjs.htm>).

wet condition. This particularly occurred during rainy season as due to the waterlogged condition of the soil, these machineries become stuck and inoperable. Farmers then have no choice but to harvest by hand. Most of the machine operators faced difficulty because they regard their jobs as eight-to-five, whereas in the race to beat the weather farming demands irregular hours and a mentality different from that of salaried workers. Consequently, many of the fields were left unattended. Machinery problems also affected the operation of *Wasan* Scheme. Machines were unsuitable to work in the wet conditions. Lack of skilled technicians meant that their down-time was high.

e) Problems of labour/workforce

The majority of farmers at *Wasan* Scheme consist of those in the middle age group of 45 and above, with little or no help from family labour. These farmers have to resort to hiring foreign labour mainly from Indonesia. Unfortunately, the problem here lies in getting hired labour as there is no quota provided for labour specifically in rice farming activities. As a result, farmers tend to resort to using either domestic labour quota and/or use seasonal workers. The use of domestic labour would entail payment of about B\$300 per month as a fixed salary. But the use of seasonal workers would entail paying more as these workers indiscriminately demand higher pay, and they would only start working once the negotiated pay has been reached. Farmers have no choice but to agree on their pay demand. This becomes a burden as not all farmers can afford to hire them.

In summary, there are numerous factors affecting the capacity of *Wasan* Scheme to achieve the socio-economic goals of government. From this study, it can be concluded that the government's current efforts to make rice farming as one of Brunei's economic diversification programme has clearly been unsuccessful and changes will have to be made at various levels if economic diversification is to be achieved.

6.5.Recommendations for Policy and Practice

In the light of the above findings of my study, there are obvious reforms and factors to consider when reviewing recommendations for both policy and the practice of rice cultivation in Brunei.

I will deal first with the possible reforms, and then move to discuss the identifiable factors

for urgent consideration when seeking to improve the agricultural (rice cultivation) practice in Brunei, for boosting both economic diversification and food security needs in the midst of a strong rentier state situation.

Suggested Reforms

Before presenting pointed suggestions for reforms, I first address two broad areas with regard to direct casual factors and conceptual / contextual background. It is clear based on the findings of the study on *Wasan* Scheme that the ambitious target for self-sufficiency has not been met and it is unlikely to be met without (a) major modification to the scheme; and (b) contextual factors which must be considered and addressed.

a) Modification to *Wasan* Scheme

The current scheme resembles a government-owned community-based scheme where the project area is divided up into almost equal parcels, distributed among the target communities; *Koseka* and *Mukim*. Furthermore, the government decides on the rice variety to plant, provide subsidized seeds, fertilisers and farming-support facilities and services, and buys rice produced at a flat rate of \$1.60 per kg determined by the government.

The issues identified in this research must be addressed in order to steer development of the *Wasan* Scheme towards a more productive path, so that it meets its rice production targets and contribute towards greater national economy. The following are suggested modifications to the scheme;

- (i) Introduce provisions in the scheme for scaling up rice farming operations, provided that the farmer can demonstrate capability to operate larger-scale farms, e.g. through good track record of farm operation and productivity over a number of years (e.g. 3 years) and/or sound business plan. This will ensure that the plans laid out on a national scale has high return-on-investment by keeping a close eye on the issues and opportunities that present themselves during the course of the tracking period. Of course, the need to address current infrastructural challenges should be addressed first in order to increase the scale of initiatives such as the *Wasan* scheme.

- (ii) Establish links to technically competent extension services to support farm operation, including planning, management and pest control. This could be done through partnership with private or government research institutions, or establishing a unit, perhaps under public-private-partnership model arrangement, that serves this purpose (of enhancing scientific-technical expertise). This is a crucial feature in ensuring that farmers are equipped with technical information that will improve their level of knowledge and increase the likelihood of best-practices adopted in their respective farms.
- (iii) Introduce flexibility to the scheme, so that farmers can grow rice and ancillary crops to meet market demands. There should be flexibility in cultivation method as well as technology used. The DAA needs only to ensure that the crop is safe for consumption and the operation does not adversely affect the environment, including other farms. This is because current farming practices enforce the idea that *Titih*, an experimental rice seed that is produced without the official privy of the government in the *Wasan* scheme produces more output than the *Laila*. As a result, the profitability of some farmers who are brave to take part in such experimental farming have enjoyed productivity and profitability during the main- and off-season.
- (iv) Improve the governmental procedure that slows the process of payment and provide better quality subsidised agricultural necessities and machineries respectively. It is often found in the current study that there is an over-reliance on the government for the attainment of affordable farm supplies because many of the farmers perform below the expected threshold of productivity and profitability, thus are unable to invest in independent and more costly options outside of the governmental privy. However, these supplies are found to perform below par and this compromises farm production. Also, despite the fact that the government is able to absorb a large quantity of rice (larger than that which can be absorbed by the open market), there is often the issue of late payment which can be assumed is due to government procedural faults. This exacerbates the poor quality of production and profitability in farms.

b) Addressing Contextual Factors

These are conditions created due to the development of Brunei over the past 1,500 years or so (Musa, 2006). The unique features of the Brunei context has been described in Chapter 3. The rentier state pattern that can be seen in Brunei speaks of the provision of social welfare benefits using export proceeds (commonly termed as “Shellfare”) and a

high reliance on the government for the local provision of jobs (about two-thirds of the total labour market). The remainder of the total labour comprises guest workers, who either carry out manual and/or unpleasant tasks or are equipped with specialized skills (Tisdell, 1998; Neville, 1985).

Brunei is a very young nation state, declaring independence from the United Kingdom in 1984. It is presently still encountering 'teething problem' in its political and government system, which has not changed much from the systems introduced by the British in 1959 in the process of preparing the country for independence. A significant factor that hampered progress is an ill-fated rebellion in 1962, which suspended the newly formed legislative council and ushered the state of "emergency" rule, which is still in force. The process of development as a nation state is therefore still in its infancy and traditional rule under a Malay Islamic Monarchy that remains prominent. The influence of the British however is highly significant, as the majority of society has been educated to various levels of education in the British overseas systems, which has established a particular worldview that is commonly found in former British colonies. The general worldview that is unique to Brunei is one that is intermeshed with the centuries-old Malay Islamic Sultanate values, cultural norms and social-political order. The immense wealth acquired with the rise in prominence of oil and gas in the 1960's strengthened the latter, as the young nation settled in its old ways under a generous benefactor, now widely referred to as the "caring monarch".

The historical development of the country influences the *Wasan* Scheme in the following ways. The Brunei society, which includes government personnel, regards itself as subjects of a "caring monarch" which is a characteristic of the rentier state thesis. As such, one of the most important characters of a good subject according to traditional (Islamic and Malay) value is that of loyalty and obedience to the monarch. This sentiment is further strengthened by the generous welfare provisions made possible by wealth derived from oil and gas resources. Society therefore is generally satisfied and complacent, rarely willing to openly criticize government decisions and projects, because it sees the government as an extension of the monarch: criticizing the government is the same as criticizing the monarch, which is not 'right' according to traditional norms, even though the monarch may not be directly involved in the decision-making at the project execution

level. Therefore, although obedience and loyalty maybe commendable virtues, they tend to paralyse the system, inhibiting any initiative and response to problems encountered in the execution and management of government schemes, such as the *Wasan* Scheme.

This paralysis often extends to the meeting room, where proposals are generally accepted without going through exhaustive deliberations. They generally also do not involve consultation with local or Brunei-based experts as well as with most stakeholders. Furthermore, government officials in charge of projects are changed due to promotion or transfer, taking knowledge of the project and its issues with them. Lessons ‘learned’ from past projects, including reasons for their failures, are lost as they are not well-documented and recorded because the modern systems are not well and fully established. As such, mistakes are repeated, and lessons are not assimilated into the specific government department’s knowledge base, which is largely confined to the personal knowledge of its personnel. The general tendency to stick with the status quo and avoid anything that could have the possibility to ‘rock the boat’ works against active development to improve the system. Until this mentality is changed, rice cultivation schemes, like most government schemes, will hardly achieve their lofty targets. They will only eke out outputs that could be counted as “successful” but at great expense. This is a trend that can no longer be tolerated in the face of economic uncertainty brought about by the current global economic slowdown and drastic drop in oil and gas price. The monarch has expressed his frustration at this tendency of government officials to avoid taking initiatives to address issues and problems in a *titah* (royal address to his subjects), where he referred to them as “robots”. The following is an extract of His Majesty’s *titah* at the National Disaster Management Council (NDMC).

"Some of the heads of department work like robots without discretion, all of them only wait for instructions, if there are no instructions, then they will not do anything."

Clearly, this mentality that is typical of rentier states will have an impact on the design and effective implementation of government schemes including the development of rice cultivation in Brunei in particular, and its contribution to GDP in general. To address these problems, the government should acknowledge the issues by reviewing its policy and adopted reforms to address the problems.

Among the solutions are open channels of information gathering and exchange that

promote not only communication between concerned parties, but also improve the transparency of problem-solution-opportunities for the betterment of the proposed scheme. This channel should be monitored constantly to engage the problems that compromise farmers' ability to achieve their expected threshold. For every goal, it is unlikely not to encounter issues in the strides to achieving it. *Wasan* is no exception as farmers have not only admitted that they do not hold the necessary farming knowledge and technical ability, but they have also revealed that they face several problems including shortage of water supplies, lack of labour quota for farming, and late repayment by the government. The active channel of information gathering and exchange will be able to pick up these issues, and will facilitate the relaying of necessary information to relevant parties for their attention. This informal platform presents itself as a level playing-field between concerned parties who would like to achieve the common goal of success in the *Wasan* scheme. This common mentality can benefit the scheme through exchanges of suggestions and ideas. Granted, not all of the input will be viable, but the bottom-up approach will certainly add value to the current scheme as farmers are the first-hand players who are experiencing the scheme. Understandably, some solutions may take longer than others. For example, the proposal for a labour quota will take longer than the processing of payment to farmers in the buy-back scheme. However, active channels of communication is a solution that can be started immediately without any bureaucracy to slow down the process. The manner in which the scheme is currently run is too rigid in the status-quo and top-down approach, and thus should be changed to reflect the needs and conditions at the ground level. Improving the solution provision in the proposed scheme through such measures, and others, will prove beneficial.

As such, two suggested reforms would be setting a realistic target of rice production and improving existing infrastructure to support rice production. However, such reforms are still in the early stage of implementation and it is too early to assess whether or not it will produce better results. One innovation which is found to be helpful is the establishment of Rice Farming Field School (RFFS) to help farmers understand the issues relating to rice planting, particularly in relation to high yield varieties such as *Laila*. The farming treatment required by these varieties is different from the traditional rice varieties and the knowledge gained in this area and in water management and pest control has helped farmers to improve their productivity.

Thus, if rice farming is to contribute to self-sufficiency and the economic diversification of Brunei, the relevant departments must look at the rice farming policy as part of a set of integrated policy system. All these reform measures should support each other in terms of preparing the country for agricultural self-sufficiency and economic diversification. This is best summed up by Yah (2009:74) that ‘productivity in rice growing, however, is not just a function of the skills and practices of the rice farmers per se, it is also a function of the essential capital input of fertiliser, irrigation facilities, better seeds, pest control, sale prices, planting and harvesting traditions, storage and transportation methods, and credit supply, many of which are outside their control’.

The *Wasan* case study has generated valuable information on the issues and problems of rice farming in Brunei which are responsible for thwarting the effort of the farmers to obtain high yields and profitability affecting the country’s vision in attaining self-sufficiency in rice production. This information should be useful to policy makers in enhancing rice production through policy measures which are realistic, systematic and evidence based. The implications of the study for practice and further research cannot be overemphasized.

c) Improving Factors for Success in Rice Cultivation

Furthermore, from the key findings of the study and the insights gained from the literature review, certain factors or principles have been identified which could be adopted as a framework for guiding successful future developments in rice farming. These key factors or principles for success are: (1) Technological improvement; (2) Research and Development (R&D); (3) Adequate infrastructure development; (4) Sufficient supply of seeds, fertilisers, pesticides and machineries; (5) Availability of bank loans; (6) Land issues; (7) Reformation in rice production system; (8) On time payment to the farmers, and (9) Farmers’ professionalism. The significance of these factors in the form of the study recommendations is now briefly discussed.

Factor 1 – *Technological improvement*

This can be done by setting up well-facilitated and affordable workshops for farmers to fix, buy and service their machineries. These workshops have to be built in places where they can be easily accessed by the farmers—for example, one station in one farming

village. Another way is by providing *rice hull gasifier engine system*⁸ to help farmers reduce production cost and to minimise the environmental hazards caused by rice hull. This aims to provide a source of energy which can be obtained through the utilisation of rice hull biomass. Additionally, this system can also be used to pump water, mill rice and generate electric power. This system has the advantage of producing an ingredient to produce organic fertiliser as well as soil conditioners in seedbed by using the ash produced after rice hull burning. Apart from that, farmers should also be able to access appropriate information on agricultural developments by using mobile technology. This mobile technology is not only restricted to rice farming but also applicable to fruit and vegetables farming, livestock, forestry and fishery. If this system can be effectively implemented in Thailand, there should be no reason as to why Brunei cannot succeed too. Subscribers to this mobile service can receive information using the agricultural directory, updates on market trends, commercial crops, new farming techniques, useful know-how, important news and weather forecasts.

Factor 2 – Research and Development (R&D)

This is vital to increase agricultural production. Based on the report by the Department of Agriculture (2009), the R&D should also involve the study of the suitability of foreign rice varieties such Thai Hommali Rice and how it can be productively and suitably planted in Brunei. Although there is a shortage of local expertise in rice research and development work, foreign experts can be hired for this activity. The DAA can provide agricultural scholarship or agricultural-based courses for the locals to produce local experts and specialists, and thus Brunei can reduce its dependency on foreign labour.

Factor 3 – Adequate infrastructure development

The Department of Agriculture (2009a) has also stressed on the development of adequate infrastructure such as roads to transport goods to the farm as well as the development of rice diseases control system:

The needs for infrastructure facilities vary from one area to another area. The development of infrastructure must be implemented from zero because much of the land is uncultivated or unexplored. As for the needs for development of rice diseases control system, it must be improved to handle the increase in rice growing areas in future (DAA,

⁸ Philippine Rice Research Institute (2011)

2009a).

The irrigation and drainage system must also be regularly maintained and supervised to ensure that they are equally distributed and can be used by all the farmers. If the water is justly channelled and drainage is in good condition, the level of productivity may be increased.

Factor 4 – Sufficient supply of seeds, fertilisers, pesticides and machineries

These materials or inputs should be properly supplied to the farmers to foster their agricultural productivity. This is because in Brunei, the local farmers are faced with infrequent and insufficient supply of subsidized agricultural inputs. While registered farmers at the DAA are supposed to be provided with subsidized agricultural inputs under the End Product Subsidy, the reality is that the necessary inputs are either unavailable at the time needed or insufficient. In either case, farmers have no alternative but to buy the inputs from the shops in Brunei or outside the country, which sell the high-quality materials at higher prices from agricultural shops in Brunei which tend to be more costly and indirectly affect farmers' income due to the high cost of production.

Factor 5 – Availability of bank loans

Apart from that, banks can be encouraged to help the farmers especially the poor ones so that they can produce better yields from adequate inputs. Grameen Bank in Bangladesh is a good example in helping farmers. Grameen Bank is a bank set up by Muhammad Yunus to assist the poor farmers in Bangladesh by giving small loans without them having to put up collateral. This bank has succeeded in helping the poor farmers raise their living standard. However, in the case of Brunei, this bank can be used to assist the farmers in increasing their agricultural productivity by giving them small loans to fund their farming activities.

Factor 6 – Land issues

Land issues need to be addressed due to the fact that most lands used for agriculture in Brunei are those which are not really suitable to meet the conditions to grow crops. Because of this, the yield produced is not as high as that of the 1970s in which the latter produced over 30% rice self-sufficiency. Therefore, the lands must be gazetted first and must be found suitable to be developed (Department of Agriculture, 2009a).

Factor 7 – Reformation in rice production system

Reformation in rice production system is also recommended through the collaboration and involvement of local farmers. Policy and decision making should also engage local farmers who are equipped with first-hand knowledge on what needs to be improved to increase yield.

Factor 8 – On time payment to the farmers

Under the government scheme, the government buys back every kilo of paddy for the price of B\$1.60. Once farmers send their paddy, they expect the payment to be immediate. The government should consider paying the farmers on time as they need the money to finance their farming activities. Delayed payment often results in the farmers having not enough money to grow their crops and to pay their workers. This can cause inconveniences, especially to those who depend on farming as their main source of income.

Factor 9 – Farmers' professionalism

The farmers themselves should also cooperate to achieve an effective farming system. The farmers should act professionally and work with each other. For example, the government supplies water for irrigation to be equally used by all the farmers. The problem is that some farmers tend to block the flow of water by flooding their crops and only release the water once contaminated with pesticides, thus affecting other farmers' crops (quality and productivity).

6.7. Implications for future research

The study strongly recommends that future research be conducted on other rice development programmes or schemes. It would be useful to study the comparison between privately-owned rice farming enterprises and the government-run rice cultivation schemes. Further, it would be insightful to compare Brunei's system of rice farming to other countries, such as Thailand, to understand how rice farming systems operate. This will provide a valuable contribution to knowledge and the rice farming practice as a whole.

6.8. Concluding Remarks

As a whole, the findings in my study suggest that the failure of the *Wasan* scheme due to numerous factors contributing to targeted goals not being met can best be understood in terms of the rentier state thesis. Though economic diversification and food security make up two espoused goals—manifested no less within the public rhetoric of the government, Brunei’s welfare state under a leadership of a widely touted “caring monarch” has gained more traction than other national goals calling for economic expansion away from its oil and gas exports and food self-sufficiency. That the protection of a local employment generation—particularly, the creation of jobs for ex-military personnel and mukim villagers—is compounded by the government’s unfailing support and further subsidies provided to these farm owners to increase their incomes would seem to suggest that the goals to diversify Brunei’s economy and establish food security are in fact secondary to, or at least undercut by, the practice of the rentier state. If improvements are to be made to diversify away from oil and gas by promoting food self-sufficiency in the local rice cultivation projects, previously listed suggestions and recommendations for policy and practice of rice cultivation have to be considered. Above all, there needs to be a concerted effort to resolve the contradictions inherent in the predominant logic of the rentier state and the two other logics of economic diversification and food security. Without attending to these considerations, arrived at through the evaluation of my findings, rice cultivation will not be able to impact the nation significantly, if at all, in terms of helping Brunei to move away from dependence on oil exports and become self-sufficient in its staple food / crop. Also, further research needs to be conducted and, so, is heavily encouraged to provide a wider lens for approaching the essential steps to improve efforts and (annual) yields for an increased success of rice cultivation in Brunei. Whilst this study explicates and provides much needed details of what had already been implied in other reports (e.g. Seventh LegCo meeting) about rice cultivation in Brunei, its findings point pertinently to the rentier state as a problem that the government may want to address when looking to resolve contradictions that the rentier state poses to the goals of economic diversification and food security. In the wake of my findings, more research is welcome so that other suggestions and recommendations that fall beyond the scope of this study can be arrived at through rigorous analysis of its own sets of research data.

APPENDICES

APPENDIX A: Interview Guide

- a) Demographic information of rice farmers, e.g. gender, age, educational level.
- b) Characteristics of rice farming, e.g. farm size.
- c) Perspectives of farmers on the viability of the Wasan.
- d) Indirect contribution of rice farming to the economy of Brunei Darussalam.
- e) Problems faced by rice farmers

APPENDIX B: Survey Questionnaires

**Title: ECONOMIC DIVERSIFICATION PROGRAMME IN
BRUNEI DARUSSALAM: A CASE OF RICE AGRICULTURE**

Survey questionnaire

Date:.....

A. Personal Details

Location:..... Description:..... Farm

Size:..... Lot No.....

1. Age..... 2. Gender:.....

3. Level of education:.....4. No. of family members:.....

5. Do you have any experience in rice planting (years)?.....

6. Are you a full-time or part-time farmers?.....

B. Structure of farm households and costs

7. Do you employ/hired foreign workers?.....

8. If yes, how many?.....

9. If no, why don't you hire any worker?

.....

10. How much is the foreign workers salary?.....

11. How many people are in the following category:

(a)Family workers:..... (b) Hired Labour:.....

(c)Seasonal:.....

12. Origin of worker (not family member):.....

13. How much do you spend per season/lot?.....

14. What types of tools do you used?.....

15. Do you have you any off-farm income?.....

C. Inputs: Source of materials

16. Where do you get your seeds, fertilisers, pesticides, and machineries?

.....

17. For those farmers who use machineries for rice farming, how much is the cost of buying or renting machineries?

18. What is the type of rice variety do you plant?

.....

.....

D. Output

19. How much do you earn from selling your output – please state the volume and income earned?

E. Markets

20. Where do you sell your output?

21. Why do you prefer to sell your products to in the local market?

.....

F. Challenges/problems

22. What are the 3 main constraints that you faced in rice farming?

.....

APPENDIX C: Permission from Department of Agriculture

JABATAN PERTANIAN DAN AGRIMAKANAN
Kementerian Perindustrian dan Sumber-Sumber Utama
Brunei Darussalam



DEPARTMENT OF AGRICULTURE AND AGRIFOOD
Ministry of Industry and Primary Resources
Brunei Darussalam

Rujukan kami: JPT/KUR/8 Vol. 14

Tarikh: 04 Jamadilakhir 1431
18 Mei 2010

Yang Mulia;
Dayang Norzurianie Hj Kamarulzaman
Pensyarah, Department of Geography and Development and Environmental Studies
Fakulti Sastera dan Sains Sosial
Universiti Brunei Darussalam
Jalan Tungku Link Gadong BE1410
Brunei Darussalam

Dayang,

**PER: MEMOHON MAKLUMAT (DATA) DAN MENEMUDUGA MENGENAI
PROGRAM PENANAMAN PADI**

Dengan hormatnya merujuk surat Dayang bertarikh 06 Mei 2010 mengenai perkara yang tersebut di atas.

Pihak Jabatan tidak ada halangan bagi Dayang untuk mendapatkan maklumat (data) mengenai padi dan seterusnya menemuduga pegawai-pegawai yang bertanggungjawab mengenai Program Penanaman Padi.

Sehubungan dengan itu, Dayang bolehlah berhubung terus ke alamat seperti berikut:

1. Untuk maklumat (data) Padi

Dayang Nurhidayat binti Dato Paduka Dr. Haji Ismail
Ketua Unit Pengurusan Maklumat & Pasaran
Bahagian Pembangunan Agribisnes & Kemajuan Daerah
Ibu Pejabat, Jabatan Pertanian dan Agrimakanan
Lapangan Terbang Lama Berakas BB3510
Negara Brunei Darussalam
Tel: 2388054 / 2388091

2. Sesi Temuduga

Awang Muda Yusran bin Abdullah
Ketua Unit Pembangunan Padi & Tanaman Ladang
Bahagian Pembangunan Tanaman
Jabatan Pertanian dan Agrimakanan, Kg. Wasan
Negara Brunei Darussalam
Tel: 2683489

d

Alamat:
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Lapangan Terbang Lama, Berakas BB3510
Tel: +673 2388 000, Faks: +673 2382 226
Website: <http://www.agriculture.gov.bn>
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Website: <http://www.agriculture.gov.bn>
Email: info@agriculture.gov.bn

APPENDIX D: Department of Agriculture

f) LAND USES

- 1) What are the types of land tenureship system for rice cultivation in Brunei? Are there any separate system for wet rice and hill rice?
- 2) For each land tenureship system, what regulations are set for rice cultivators?
- 3) Is there any limit to the size of the land for the rice cultivators in any of land tenurehsip system they are entitled? If yes, state the hectarage.
- 4) With reference to gazetted land in wet rice cultivation, what are the terms and conditions for people who want to apply?
- 5) Who are entitled for the gazetted land?
- 6) What are the rules and regulations set for rice cultivators who uses gazetted land for rice cultivation?
- 7) Why choose certain types of rice varieties?

g) PADDY PRICE SUPPORT SYSTEM

- 1) When is this scheme introduced?
- 2) Why is this scheme introduced?
- 3) Who are entitled for this scheme?
- 4) What are the terms and conditions for the participants of this scheme?
- 5) What are the strategies adopted by the Department of Agriculture in order to encourage people to participate in the scheme?

h) RICE CULTIVATION IN GENERAL

- 1) What is your opinion of the development of rice cultivation in Brunei?
- 2) What problems have your department faced in implementing rice cultivation?
- 3) How do you solve these problems?
- 4) What are the strategies outlined for rice cultivation in future?

i) WASAN SCHEME

- 1) When did the Wasan project started?
- 2) Who are the farmers at Wasan?
- 3) How Wasan was developed?
- 4) Are there any specific output targets for rice farming in general and Wasan in particular?
- 5) Who is responsible in managing rice farms at Wasan?

APPENDIX E: Output of Statistical Analysis Table A1: Variable Definitions

Table A1: Variable Definitions

Variable Name	Variable Definition	Hypothesized Impact	Hypothesized Impact
		Productivity	Profitability
Group	Koseka or Mukim		
Gender	Male or female		
Age	Less than fifty-five years or fifty-five years and older	+	+
Education	Primary and less or secondary and above	+	+
Experience	Less than twelve years or twelve years and more	+	+
Off-farm Income	Less than B\$2,000 or B\$2,000 and more		
Knowledge	Level of Knowledge on paddy production High, Moderate or low	+	+
Annual Farming Expense		-	-
Planting Mechanisation	Fully mechanised, mixed or fully manual	+	+
Harvesting Mechanisation	Fully mechanised, mixed or fully manual	+	+
Supplies	Source of Supplies (Seed, fertilisers, pesticides, machine purchase, Machine Rental). Either Official or Unofficial Sources		
Size of Farm	Less than 1.5ha or 1.5ha and more	+	+

Total Yield and Total Yield per hectare	Main and off season		
Amount sold to scheme			
Direct Income	Based on paddy sold		
Indirect Benefits	Amount of farm yield consumed and amount giving out as gifts or alms		
Seedlings	Portion kept as seedlings		
Amount Consumed by Farmers			-
Amount given as gifts or alms			-
Labour: Full-time	Less than two full-time labourers or two full-time labourers and more	+	+
Labour: Others	Less than three other (part-time and seasonal) labourers or three other labourers and more	+	+
Labour: Total	Less than five total labourers or five other labourers and more	+	+

Table A 2: t-Test for Ages by Farming Group

Group	Mean	Std. Deviation	t-test for Equality of Means		
			T	df	P(2-tailed)
Koseka	56.97	9.13			
Mukim	54.75	10.64	0.77	50	0.44

Table A 3: t-Test for Years of Experience by Farming Group

Group	Mean	Std. Deviation	t-test for Equality of Means		
			T	df	P(2-tailed)
Koseka	12.40	10.32			
Mukim	10.25	4.74	0.795	50	0.430

Table A 4: t-Test for Years of Experience by Gender

Group	Mean	Std. Deviation	t-test for Equality of Means		
			T	df	P(2-tailed)
Male	11.99	9.25			
Female	8.75	4.33	0.690	50	0.494

Table A 5: t-Test for Main Season Farm Size by Farm Group

Group	Mean	Std. Deviation	t-test for Equality of Means		
			T	df	P(2-tailed)
Koseka	2.03	1.38			
Mukim	1.20	0.58	2.317	50	0.025

Table A 6: t-Test for Main Season Farm Size by Gender

Group	Mean	Std. Deviation	t-test for Equality of Means		
			T	df	P(2-tailed)
Male	1.84	1.28			
Female	1.03	0.39	1.262	50	0.213

Table A 7: t-Test for Off-Season Farm Size by Farm Group

Group	Mean	Std. Deviation	t-test for Equality of Means		
			T	df	<i>P</i> (2-tailed)
Koseka	2.17	1.17			
Mukim	1.20	0.58	3.114	50	0.003

Table A 8: t-Test for Off-Season Field per hectare by Farm Group

Group	Mean	Std. Deviation	t-test for Equality of Means		
			T	df	<i>P</i> (2-tailed)
Koseka	1590	879.49			
Mukim	3090	1249.23	-4.971	50	0.001

Table A 9: t-Test for Main-Season Income per hectare by Group

Group	Mean	Std. Deviation	t-test for Equality of Means		
			T	Df	<i>P</i> Value
Koseka	2378	1408.3	-0.539	43	0.593
Mukim	2602	958.9			

Table A 10: t-Test for Off-Season Income per hectare by Group

Group	Mean	Std. Deviation	t-test for Equality of Means		
			T	Df	<i>P</i> Value
Koseka	2432	1519.6	-4.97	41	0.001
Mukim	4697	1857.5			

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